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OF AVICENNA

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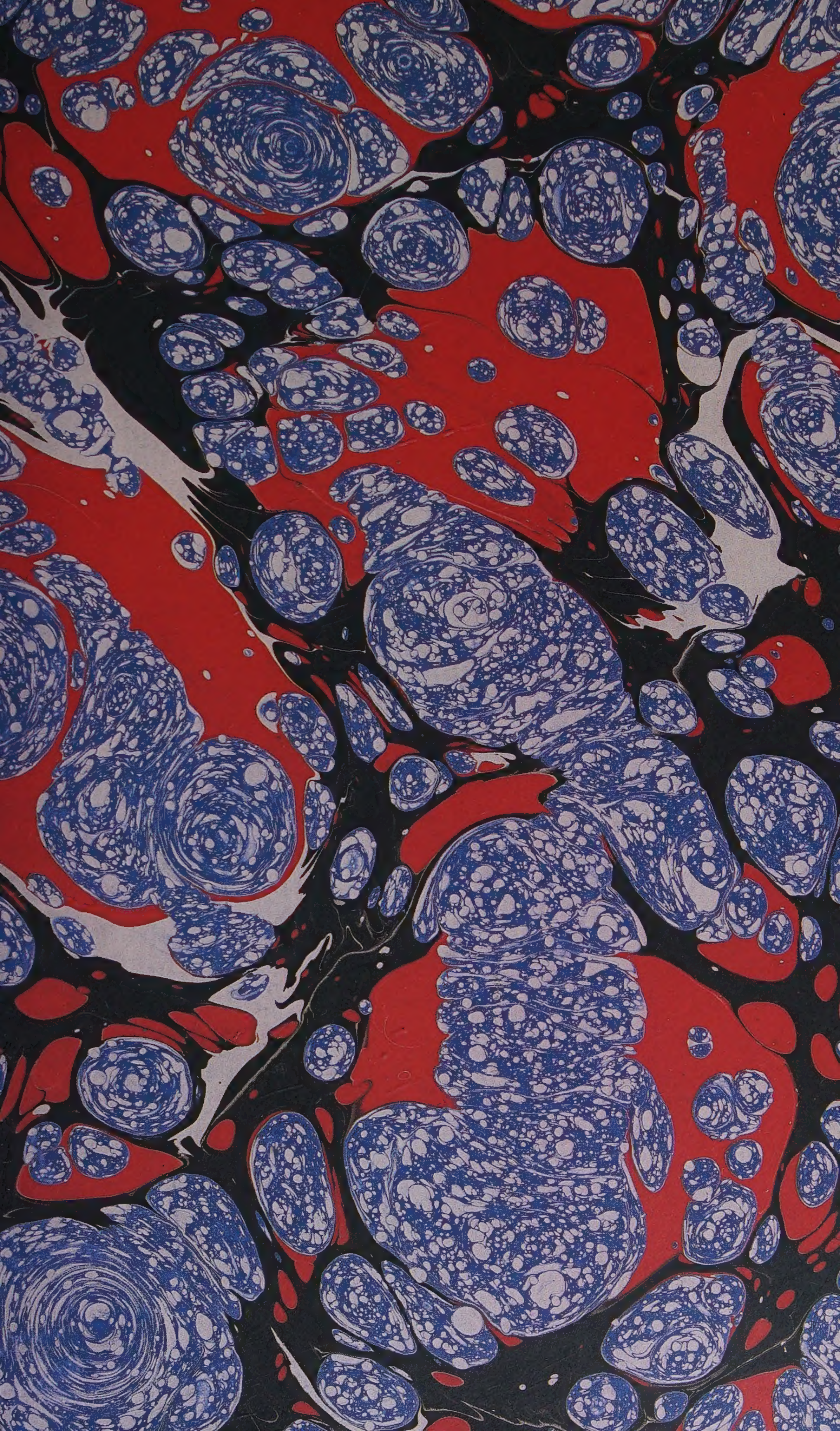

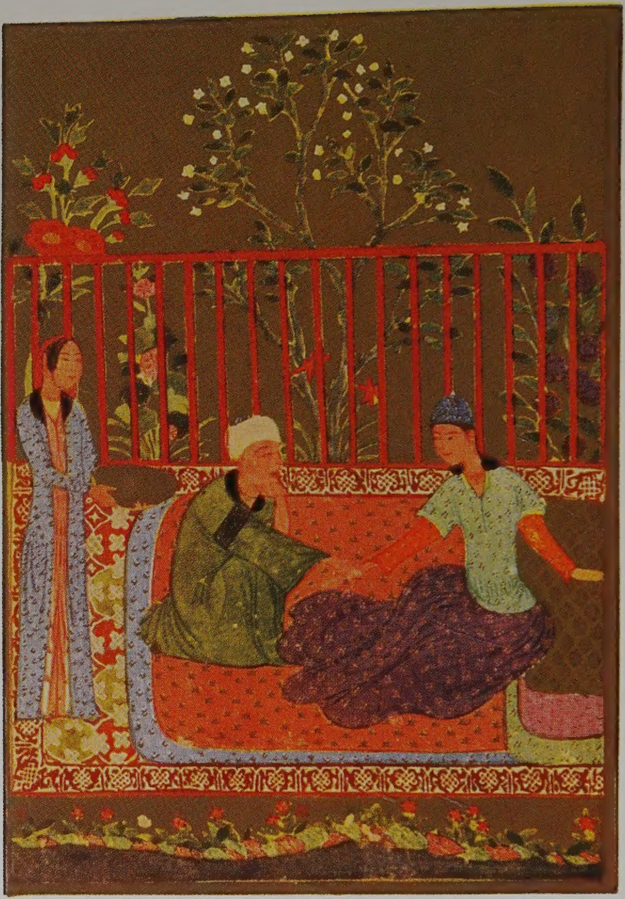

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A physician and his patient.
From an early Persian MS. (Add. 27,261, f. 371b)

"A great sage—a reader of ancient books, Greek, Persian, Latin, Arabian, and Syriac; and skilled in medicine and astronomy, both with respect to their scientific principles and the rules of their practical applications; he was experienced in all that healeth and hurteth the body; conversant with the virtues of every plant, dried and fresh, the baneful and the useful. He was versed in the wisdom of the philosophers, and had compassed the whole range of medical science and other branches of the knowledge-tree."

(*4th Night—Burton; Lane.*)

THIS SPECIAL EDITION OF

THE CANON OF MEDICINE
OF
AVICENNA

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THE CANON OF MEDICINE OF AVICENNA

A TREATISE ON
THE CANON OF MEDICINE
OF
AVICENNA

INCORPORATING A TRANSLATION OF THE FIRST BOOK

BY

O. Cameron Gruner, M.D. (Lond.)

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Fr Bleyswyck
1740
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LONDON
LUZAC & CO.
46 GREAT RUSSELL STREET, W.C.1
1930

" Man has been truly termed a ' microcosm,' or little world in himself, and the structure of his body should be studied not only by those who wish to become doctors, but by those who wish to attain to a more intimate knowledge of God, just as close study of the niceties and shades of language in a great poem reveals to us more and more of the genius of its author."

GHAZZALI, *Alchemy of Happiness*
(Wisdom of the East edition).

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PREFACE

The purpose of the present treatise is two-fold :

(1) To furnish a translation of the First Book of the Canon of Medicine of Avicenna. The section on Anatomy has been omitted in favour of the first half of the *De viribus cordis*. This assists in the second object of this treatise. Distinctively large type is used for the translation.

(2) To present a study of its mystical philosophy (*tassawuf*), especially showing where this and modern biological knowledge are reciprocally illuminative.

The words of the late Prof. E. G. Browne may be quoted here : " Even if we rate the originality of Arabian medicine at the lowest, I venture to think that it will deserve more careful and systematic study."

Furthermore, the Thomistic philosophy of human nature is specially discussed, and its applicability to the Medicine of the future is definitely enunciated.

A grateful acknowledgment is made to the School of Oriental Studies, London Institution (University of London) for signal help in the acquisition of the Arabic, Persian, and Chinese essential to the purposes of the treatise.

O. Cameron Gruner.

London, December, 1929.

CONTENTS

A. The Treatise

PAGE

Preliminary Thesis. The Canon of Medicine in relation to modern thought - 1
- I. The intellectual culture contemporary with Avicenna (§1–6) - 2
  - (*a*) In the central Saracen empire. (*b*) In the western Saracen empire. (*c*) Among the Chinese.
- II. The knowledge presented by the Canon, as compared with that of to-day (§ 7–18) - 5
  - (*a*) The Canon is a précis. (*b*) The word "Canon." (*c*) The word "knowledge." (*d*) Mystical insight.
- III. The basic difference between the Canon and Modern Medicine (§ 19–22) - 8
- IV. Special differences between the Canon and Modern Medicine (§ 23–37) - 10
  - (*a*) Conceptions known to Avicenna; not now recognised. (*b*) Conceptions known to modern medicine, but not to Avicenna. (*c*) Knowledge common to Avicenna and modern medicine.
- V. Of interest to the Scholar (§ 38) - 18
- VI. Brief survey of the Intention of this treatise (§ 40–44) 19

The doctrine of Matter and Form (§ 55–108) - 39

Death and Destiny (§ 111–115) - 72

The Humours (§ 116, 117) - 76

The basis of Anatomy in the Canon (§ 118–127) - 103

The doctrine of the Breath (§ 136–150) - 125

Scholastic psychology (§ 155–165) - 139, 143

Coloured Plate representing the corporeal and psychical Faculties *facing p.* 143

The Bath-house (§ 198, 199) - 232

Expiative causes of Disease (§ 201) - 255

Chinese sphygmology (§ 208–224, 234, 235) - 285

Table of Terminology relative to the Pulse (Latin, Arabic, Chinese) *facing p.* 289

The doctrine of the pulse (§ 218–220, 225–230, 231–233) - 293–308

Urinalysis, ancient versus modern (§ 238–239) - 349

Dietetics (§ 195, 248–253) - 219, 414

Ornamental Plate, with special portraits - *facing p.* 553

Concluding Survey (§ 267–300) - 553

Plate: Rembrandt, "The Raising of Jairus' daughter" - *facing p.* 567

Appendix: I. Progress; II. Facts—Knowledge—Truth - 569

III. The Materia Medica of the Canon - 571

References - 573

B. THE TRANSLATION

PAGE
Introductory words (**1–5**) - - - - - - - - - 22

BOOK I

PART I

THESIS I. DEFINITION AND SCOPE OF MEDICINE (**6–18**) - 25
THESIS II. COSMOLOGY (**19–25**) - - - - - - - 34
THESIS III. THE TEMPERAMENTS (**26–66**) - - - - 57
THESIS IV. THE HUMOURS (**67–113**) - - - - - 76
THESIS V. ANATOMY (**114–135**) - - - - - - 93
THESIS VI. GENERAL PHYSIOLOGY (**136–173**) - - - 107
PSYCHOLOGY (**174–183**) - - - - - - 135

PART II

DISORDERS OF HEALTH

THESIS I. DEFINITION OF TERMS (**191–230**) - - - - 156
THESIS II. THE CAUSES OF DISEASE. ETIOLOGY (**231–451**) 173
A.—Unavoidable Causes - - - - - - - 175
(i) Extracorporeal.
The influence of seasonal changes on the body - 183
Climate: (*a*) Latitude, (*b*) Altitude, (*c*) Mountains, (*d*) Seas, (*e*) Winds, (*f*) Soil, (*g*) Marshes (**305–332**) - - - - - - - - 195
(ii) Corporeal. Causes unavoidable because physiological. - - - - - - - - - - 210
Dietetics (**347–360**) - - - - - - - 214
The various kinds of drinking water (**361–392**) - 221
B.—Facultative Causes of Disease - - - - - 230
Balneology (**400–414**) - - - - - - - - 232
THESIS III. THE EVIDENCES OF DISEASE.
Semeiology (**452–677**) - - - - - - - - 257
Sphygmology (**515–602**) - - - - - - - - 283
Urinoscopy (**603–674**) - - - - - - - - 323
The Alvine Discharge (**675–677**) - - - - - - 353

PART III

THE PRESERVATION OF HEALTH (**678–904**) - - - - 357
Dietetics (**759–814, 855–859**) - - - - - - 394, 432

PART IV

THE TREATMENT OF DISEASE (**905–1085**) - - - - - 460
BOOKS II–V. BRIEF LIST OF CONTENTS - - - - 532
Translation of "De Viribus Cordis" (**168–173, 1086–1130**) 123, 534
INDEX - - - - - - - - - - - - 579

PRELIMINARY THESIS

The Relation between the Canon of Medicine of Avicenna and Modern Thought

CONSIDERATIONS are not wanting which entitle the Canon of Medicine of Avicenna to an esteemed position in modern thought. In the first place, there is the outstanding intellectual culture of the Saracen Empire during the period of history to which Avicenna belongs. Secondly, in the case of much of his teaching, it may be said that the difference from ours is largely only that his speech is alien, and is apt to be misunderstood. In these days, the great complexity of the language with which we express our scientific thought corresponds with the intricacy of the instruments wherewith facts are elicited. Thirdly, many of the advances of modern times offer the solutions to the very theorems and propositions of former times. Finally, ideas are to be found in his work which provide suggestions for useful research in the future.

§ 1. The importance of idea over material achievement is not to be forgotten. The achievements of any age are subject to decay with the lapse of centuries, but the ideas which gave rise to them remain living through all cycles. Therefore to propose a real place for Avicenna in modern thought is not to propose a return, as it were, to old architecture, or the costumes of long ago. It is rather to render accessible to-day the picture which he painted, and so enable it to renew its still vital message. It is to play over again the music which he expressed, and enable perhaps one or two to rejoice in it. And this without obscuring the issue by discussing nationality, or schools of thought, or evolution of ideas, or technical methods.

If it appear to some a fault that the master appears to have used passages from other works, and this without full acknowledgment, it should be remembered that after all a painter may use pigments which someone else has manufactured, and is allowed even to employ other persons (usually pupils) to execute certain portions of his picture. Indeed, even after his decease, it is not improper that some may have been entrusted with the delicate task of touching up faded portions of the canvas which he bequeathed.

The place for Avicenna in modern thought is gained when it is agreed that he shall be viewed as one who entered this world entrusted with a mission independently to express for that age, by means of those various tools which he then found in it, the wisdom which is unchanging and impersonal. So also there is the need to-day that this same wisdom should be re-expressed for this age by means of the new data which lie to our hands.

I

THE INTELLECTUAL CULTURE CONTEMPORARY WITH AVICENNA

§ 2. (*a*) *Intellectual Culture in the Central Saracen Empire.* Carra de Vaux, in his monograph " Avicenne," [13] furnishes particularly striking comments, as follows (p. 156) :—

" The more we investigate the enormous literary output of the Arabian empire, and come into intimate appreciation of the master minds of the middle epoch and of antiquity, the more we become aware of their sincerity.

" We should, we think, offer our salutations to these great personalities of that day, whose works and lives were equally encyclopædic. . . .

" Our own times do not show more worthy figures ; we complacently assume that there are no more worthy than ourselves because science, so greatly developed to-day, cannot be held all within one single head. That may be. But it is only right to admit that science has less unity and harmony to-day than formerly it had ; that it is less pure than it was under the grand peripatetic discipline. Our attitude towards that is neither humble nor sincere.

" In these days we are concerned too much to have our name blazoned forth than to grasp a great extent of science. We are more anxious to uphold the profession than to have a passion for study ; we seek titles and reputation rather than real knowledge ; and in order to appear more specialistic than our ancestors we expose ourselves to the judgment of posterity as having smaller minds, and fettered souls."

§ 3. (*b*) As to the state of civilization in *the western Saracen empire*, we have the very illuminating description of Ameer Ali in his " The Spirit of Islam " [2] (p. 392) :—

" The Arabs covered the countries where they settled with networks of canals. To Spain they gave the system of irrigation by flood-gates, wheels and pumps. Whole tracts of land which now lie waste and barren were covered with olive groves, and the environs of Seville alone, under Moslem rule, contained several thousand oil-factories. They introduced the staple products, rice, sugar, cotton, and nearly all the fine garden and orchard fruits, together with many less important plants, like ginger, saffron, myrrh, etc. They opened up the mines of copper, sulphur, mercury, and iron. They established the culture of silk, the manufacture of paper and other textile fabrics ; of porcelain, earthenware, iron, steel, leather. The tapestries of Cordova, the woollen stuffs of Myrcia, the silks of Granada, Almeria, and Seville, the steel and gold work of Toledo, the paper of Salibah, were sought all over the world. The ports of Malaga, Carthage, Barcelona and Cadiz were vast commercial emporia for export and import. In the days of their prosperity, the Spanish Arabs maintained a merchant navy of more than a thousand ships. They had factories and representatives on the Danube. With Constantinople they maintained a great trade which ramified from the Black Sea, and the eastern shores of the Mediterranean, into the interior of Asia, and reached the ports of India and China, and extended along the African coast as far as Madagascar.

" In the midst of the tenth century, when Europe was about in the same condition that Caffraria is now, enlightened Moors, like Abul Cassem, were writing treatises on the principles of trade and commerce. In order to supply an incentive to commercial enterprise, and to further the impulse to travel, geographical registers, gazetteers, and itineraries were published under the authority of Government, containing minute descriptions of the places to which they related, with particulars of the routes and other necessary matters. Travellers like Ibn Batuta visited foreign lands in quest of information, and wrote voluminous works on the people of those countries, on their fauna and flora, their mineral products, their climate and physical features, with astonishing perspicacity and keenness of observation.

" The love of learning and arts was by no means confined to one sex. The culture and education of the women proceeded on parallel lines with that of the men, and women were as keen in the pursuit of literature and as devoted to science as men. They had their own colleges (for instance, at Cairo, established in 684 A.M. by the daughter of the Mameluke Sultan Malik Taher) ; they studied medicine and jurisprudence, lectured on rhetoric, ethics, and *belles-lettres* and participated with the stronger sex in the glories of a splendid civilization. The wives and daughters of magnates and sovereigns spent their substance in founding colleges and endowing universities, in establishing hospitals for the sick, refuges for the homeless, the orphan and the widow."

§ 4. (*c*) Cordova, the most celebrated western university of the Empire at the time of Avicenna.—This is well known as an instance of the high degree of culture of the day. Ameer Ali,[2] speaks of " that wonderful kingdom of Cordova, which was the marvel of the middle ages, and which when all Europe was plunged in barbaric ignorance and strife alone held the torch of learning and civilization bright and shining before the western world." The greatness of the city is indicated by its population, which is given by Haeser[26] (i. 662) as 300,000, and by Campbell[12] (p. 57) as one million ; and by the library of " about 200,000 " volumes. To see the city to-day, traversed as it can be from wall to wall, within half an hour on foot, and to read of an extent of " 24 miles one way, and six in the other " (Ameer Ali[1], p. 517) shows that the word " kingdom " conveys a truer idea of its greatness. To read of " innumerable libraries, 3,800 mosques, 60,000 palaces and mansions, 200,000 houses inhabited by the common people, 700 baths, 80,000 shops, besides hostels and serais " is to wonder how so much can have come to be now represented by so little.* Nevertheless, the "grand mosque" alone, which is still at any rate externally intact (and interiorly is still surely one of the wonders of the world despite its mutilation) stands sponsor for the rest; and no doubt many of the existing imposing buildings—now devoted to very different uses—stand for the palaces and mansions. As to the literary treasures, these have been traced at least in part from Spain to Fez, as shown by Horne[33] (p. 32, 61), with the *Roud El Qartas* as his authority; and he then points to years of pilfering from the library of the great mosque of El Karouiyan at Fez, as having scattered these works for ever out of ken.

§ 5. A study of the street names, and even the place names and current dialect in "Moorish Spain" to-day also confirms the story of past greatness. But the mystical knowledge displayed in the dispositions of the decorative designs and their poetic inscriptions on the walls of the Alhambra halls, state-rooms, and private apartments can leave no doubt of unsurpassed artistic power, where every sense-impression was deliberately drawn on. Lights and shadows, and colours changing with the hours of the day; musical effects of simultaneous diversity of disposition of flowing water; perfumes; courting of the prevailing breezes; interior architectural form; and furnishings, animate and manufactured—all these were combined for the achievement of a perfect representation of (divine, over and above human) Beauty.

§ 6. (*d*) *Among the Chinese.* The bearing of Chinese philosophical thought on the subject of Avicenna lies in the fact that we here meet with a notable example of intimacy of relation between world-conception and Medicine. The writings which are so carefully studied to-day by so many sinologists were extant at the time of Avicenna, and are still held in the highest esteem by Chinese thinkers. The modern Chinese philosopher is supposed to say to the Westerner (Somerset Maugham[54]): "What is the reason for which you deem yourselves our betters? Have you excelled us in arts or letters? Have our thinkers been less profound than yours? Has our civilization been less elaborate, less complicated, less refined than yours? Why, when you lived in caves and clothed yourselves with skins, we were a cultured people. . . ." The attitude towards western learning so displayed may be blamed by many, but is certainly praised by those who have studied the philosophy most deeply. As long ago as 1876 we read conclusive evidence (by Sir Henry Howarth[35]) that much of our vaunted civilization actually came from that ancient race. If some students discuss their philosophy with a certain cynicism (Forke[23]), others (Bruce[11], Wilhelm[101]) see into the justice of their conceptions. As Carus[15] remarks: "We need not be blind to the many errors and absurdities of the ancient occultism to understand and grant the truth that underlies its system." These words are exactly applicable to the Canon of Medicine of Avicenna.

---

* "Every dwelling-place, even if it has been blessed ever so long, will one day become a prey."—(Old saying quoted by Ameer Ali,[1] p. 125.)

It should be added that errors and absurdities are apt to be ascribed to ancient authors which really arose from misunderstandings and ignorance on the part even of contemporary pupils. The subsequent generations perpetuated the errors, and even in these days the attempt to represent the real meaning of ancient texts by translations exposes one to unexpected extraordinary pitfalls. Our idiom is so diverse from the technical Chinese.

II

THE NATURE OF THE KNOWLEDGE PRESENTED BY THE CANON

§ 7. (*a*) *The Canon is a précis*, and not a sum-total of Avicenna's knowledge. Numerous passages occur in the Canon which show that this is the case, that it is a series of notes or skeleton outlines of thought not too lengthy to be memorized by his students (**5**)—much as they would memorize the Quran. Thus: (**2**) "to the full extent necessary, and yet with apt brevity," (**16**) "do not place in medicine what does not belong to it," (**34**) "having discussed the equable temperaments *sufficiently*," (**80**) "I purposely omit reference to certain other problems relative to the fluids of the body": "just as much as is necessary to enable you to practise medicine intelligently." Many passages also refer to others of his own works for further details, to avoid confusing the purely medical issue of the Canon. These (philosophical) works are gradually becoming more widely known.

"Generally speaking, the saying of the saints and sages are terse, presenting only the germs of truth; these are developed by later teachers and then expanded and added to. We must see to it, however, that we get at the original meaning of the saints and sages." (Chu Hsi[10], p. 168.)

"Books are only words, and the valuable part of words is the thought therein contained. That thought has a certain bias, which cannot be conveyed in words, yet the world values words as being the essence of books. But though the world values them, they are not of value; as that sense in which the world values them is not the sense in which they are valuable." (Chuang Tzu, Giles trans. p. 170).

§ 8. To say that a work is the product of the age in which an author lives is certainly often an error, for it is to confuse the person's insight with the tools (the language at his command) available to express himself with. Similarly to work out the relation between a literary work and the religious belief of the author, as for instance to show the relation between Islamic science and the Koran carries the same fallacy with it. The Prophet says "every soul when born is a faithful follower; it is afterwards that he becomes unfaithful"—which is to say that the form of religious belief is a secondary implantation, whereas the spirit of a sincere life can be traced to the original being.

Avicenna's medicine, like Indian medicine, has been traced to the Greek system. But it has been proved that the great works of Charaka and Susruta were available in Arabic, under the title of Kitab-Shawshura-al-Hindi, from the seventh century ("Ayurveda," 1924, i. 1; and *see also* Weber, Hist. of Indian Lit.).—Similarly, the view that the Chinese borrowed their philosophy of the five elements from the Turks has been sufficiently disposed of by Forke. (p 242, 243).—It is beside the purpose of this treatise to take up such questions.

§ 9. The common notion that progress or stagnation in secular knowledge has a causal relationship with (a certain) religion is typically voiced in his address on "Medicine and the Church," by Sir Farquhar Buzzard[103] (1927). The comment to make is: "*post hoc sed non propter hoc.*" The advances in the science of medicine, as in all other sciences, are surely a part of the (divine) plan for mankind; whereas the collateral abandonment of religious fundamentals remains a human responsibility.

§ 10. (*b*) *The word* "*Canon*" (*Qanun*).—Equivalent words: code of laws; series of principles. Tao 道 (cf. Forke[24]). Principle is defined as "something antecedent, which exercises a real positive influence upon the consequent" = Causes (four kinds, **13**) = Reasons.

In view of this it is clear that the Canon is not properly to be regarded as an "encyclopædia" of the knowledge of the time, or to be contrasted, for instance, with the now classical "Osler."

§ 11. (*c*) *The word* "*knowledge*." Knowledge is not simply an assemblage of "facts"; nor is it to be made synonymous with "truth"—certainly not Absolute Truth, of which all human knowledge falls short (see diagram in Appendix), although one single word is capable of containing or implying all knowledge, as in mathematics a single term may be equated with an infinite number of terms summed together. But even the mathematical sciences can only afford approximate truth (Hume, quoted by Maher[50]: p. 238). We may recall the words, "if he attain to all knowledge, he is far off still" (à Kempis[95], ii. 11).

§ 12. Facts, as S. Thomas[81], (i. 53) explains, are what our intellect regards external objects as, and as we judge of them only in terms of our sense-organs, these objects may be different. God knows them as they are. Our intellect depends on our imagination, and that depends on our senses, and our senses only convey discrete fragments which we gather into one continuous impression regardless of intervening points." We live as it were in a network only the nodes of which are evident to the senses.

§ 13. (*d*) *Mystical Insight.*—There is a distinction between knowledge gained in the ordinary manner and that gained by "mystical insight" (*Kashf*). The writer of Gulshan-i-Raz[25] (couplet 299, p. 30) advises his readers to follow this, saying:

> "Straightway lift yourself above time and space,
> Quit the world and be yourself a world for yourself."

And:

> "The moment we are enlightened within,
> We go beyond the voidness of a world confronting us."
> —Seng-ts'an, quoted by Susuki,[91] p. 185.

As this "opens up all of a sudden a world hitherto undreamed of, it is an abrupt and discrete leaping from one plane of thought to another" (ib. p. 200).

> "Real science is seeing the fire directly,
> Not mere talk, inferring the fire from the smoke.
> Your scientific proofs are more offensive to the wise
> Than the urine and breath whence a physician infers."[25]
> —(p. 306.)

"Man looks at the surface of the ocean. Yet he is so small that he cannot even be compared to one of its drops, limited as he is in intellect and in his knowledge. It is only to those who, having just touched creation, bow to God, forgetting their limited self, that God has remained. These through whom God has spoken are the only beings who have been able to give any truth to the world."[39]—(*Rosegarden*, 1st ed., 120.)

§ 14. "The mind is not like a horizontal door which has to be made larger by force. You must clear away the obstructions arising from creaturely desire, and then it will be pure and clear with no limit to its knowledge. Heng Ch'u said: "When the Mind is enlarged it can enter into everything throughout the universe" Chu Hsi[10] (i. 182). "He who praises God knows about Him."

This attitude towards Nature is to be claimed for Avicenna, on the plain evidence of his other writings, including the "Al Najat" which appropriately appears in the Arabic version of the Canon printed at Rome in 1593, and of the Libellus on the powers of the heart[4] (real authorship disputed) which Arnold of Villanova translated into Latin (ca. 1235-1312)—and is included in the Latin edition of the Canon, 1595.

The acquisition of knowledge by this process demands nothing more than a keen observation of the life around us, and was as much within his reach as ours. Such knowledge is not too restricted to one period of history, one language, or to one or two universities. And if it should seem that because our civilization is so different his opportunities were much less, we may pause to reflect that the difference between our age and his is chiefly one of mechanical appurtenances and phraseology; and that even to this day we need not travel far (e.g., the old streets of Cordova and Granada, or more definitely, to northern Africa) to see much the same sort of scenery as he was accustomed to, much the same sort of life as is drawn in the "1001 Nights." In any case, what is human life, at bottom, but a matter of buying and selling, receiving and giving, seizing and relinquishing, constructing and demolishing, acquiring learning and losing it, seeking power and breaking it, bidding and forbidding, covenanting and comminating, giving in marriage and seeking to obtain in marriage, birth and death.

§ 15. The significant phrase "seeing into one's own Nature" (Hui-neng: Susuki,[91] p. 203, in which most admirable work occur many passages by way of explanation) gives a graphic description of that which gives Avicenna his superiority. The Canon is simply the *medical garb* in which the one Truth is expounded. It is for us also to perceive it in whatever idiom it might be described—Western, Eastern—Islamic, Confucian or Buddhist, e.g.

It would then seem as if the mind were now able to float as it were round all the concepts man has ever given to the world, or round all the most familiar events of one's daily life, and perceive clearly that which can never be set forth in words. We should then also quote the words (given in *ib.*, p. 223, in reference to *satori*—enlightenment) "I perceive of it that it is something, but what it is I cannot perceive. Only meseems that, could I conceive it, I should comprehend all truth."

§ 16. Further than this, to find that some of the statements in the Canon are certainly erroneous, and that modern investigations have placed us at an infinitely greater advantage, does not invalidate the work as a whole. Its possibilities for suggesting thoughts of real value to-day are more realized the more one reads "between the lines," and the present treatise does not claim to exhaust them.

"Let not the authority of the writer offend thee, whether he be of title or great learning, but let the love or pure truth entice thee to read" (â Kempis[95], i. 5).

§ 17. Insight into eternal truths.—A person may (*a*) glimpse them, (*b*) understand them moderately, (*c*) understand them fairly thoroughly. But in describing them to another, he may explain them (i) imperfectly (no one can explain them properly !), (ii) inadequately or incompletely, (iii) wrongly, because of (*a*) imperfect education, (*b*) educational bias, (*c*) religious or anti-religious bias, (*d*) inherently erroneous methods of thought, (*e*) restriction to logic. Such truths, again, may be denied by persons being told of them, for because in their turn they misunderstand, or understand only in part, either through careless attention, and (*a*) to (*e*).

§ 18. Insight *versus* Intuitional Knowledge.—A note should here be made that the term "insight" as used here bears a rather different meaning to that pertaining to the term "intuitive knowledge," which S. Thomas[83] ascribes solely to the angelic mind, and defines as "the attainment of the truth of a thing at a single glance without the aid of reasoning" (liv ; lv. 2 ; lviii.3, 4 ;[84] vol. 3, p. 51-87 ; Pegues,[75] p. 18). On the other hand this mode of perceiving truths need not be disallowed a rudimentary commencement among the powers of the human soul, just as the "brute" mind must be allowed to contain rudiments of those high mental capacities which characterize the human being. Throughout all orders of creation, the lower are endowed with the scaffolding for the manifestation of successively more exalted capacities of the higher.

III

THE BASIC DIFFERENCE BETWEEN "THE CANON" AND MODERN MEDICINE

The Canon treats of	Modern Medicine consists of
I. Speculative "Medicine." Certain fundamental principles (Cosmology, psychology, metaphysics)	
II. Practical Medicine.	
A. Application of I to the study of (i) health, (ii) disease (tendency, predisposition, threshold stage, declared disease, (iii) cessation of life.	A. Principles of Medicine Theory : The application of the facts of chemistry, physics, anatomy, biology to the systematic description of innumerable "diseases" classified as far as possible on the basis of the microbic theory. Symptomatology. Etiology. Diagnosis.
B. Actual treatment of "disease" by (i) regimen, (ii) drugs, (iii) operative interference.	B. Practice of Medicine. (*a*) Laboratory work. (*b*) Therapeutics, pharmacology and dietetics. (*c*) Surgery. (*d*) Gynaecology and Obstetrics. (*e*) State Medicine : Hygiene in all its branches. (*f*) Psychological Medicine: Treatment of insanity. (*g*) Legal medicine, etc.

Modern medicine is based on the conception of the universe as a conglomeration of dead matter out of which, by some unexplainable process, life may become evolved in forms. To Avicenna the whole of the universe is the manifestation of a universal principle of life, acting through the instrumentality of forms. Or, again, in modern medicine, the forms are the source of life; to Avicenna they are the product of life. Space itself is an aspect of the one life (Hartmann, on Paracelsus, [28]*a*, p. 217).

§ 19. In this way the difference between Avicenna's conception of "principles," and that of modern medicine is easily shown. To the school-boy "science" would consist of (*a*) "bookwork," (*b*) laboratory work, which his teachers would insist is the basis of (*a*). Similarly, the medical curriculum begins with lectures, though these are more and more inclined to become laboratory demonstrations; and goes on to laboratory and hospital work.

§ 20. In short, Avicenna's medicine, and all ancient medicine, is intimately bound up with philosophy, to wit, *that of human nature*—a philosophy which proves to be virtually identical with "modern scholastic philosophy," no doubt partly because the Quranic account of the origin of Man tallies with the Christian.

§ 21. Modern Medicine, on the other hand, assuming the title and rank of a positive science, emphatically discards and excludes it. Hence we read: "the physiologist" (said Burdon Sanderson) "can pursue philosophy if he has a turn for it, but must understand that the moment he enters the field of philosophy he leaves his tools behind him"; or "it is unfortunate that the limitations of scientific thought were often ignored by men of science in their writings . . . the result diverts those who know, but befogs the unsuspicious reader who will probably put the blame on his intelligence" (Ed. Hughes[36]).

"According to Positivism, science cannot be as Aristotle conceived it, the knowledge of things through their ultimate causes, since material and formal causes are unknowable, final causes (are) illusions, and efficient causes (are) simply invariable antecedents, while metaphysics under any form is illegitimate" (Sauvage,[17], xii. 313). Or, expressed more boldly, "philosophy" is considered to be the exact antithesis of the truth which modern medicine gives us, and is therefore inherently inadmissible to medicine.

The ignorance which accounts for this attitude is only met by insisting on proper definitions of terms. The following apply here: Philosophy is "the science which is concerned with first causes and principles; it is the profound knowledge of the universal order, and the duties which that order imposes on man (Mercier, Logique, 1904; de Wulf[17]: xii. 26). Again, philosophy is the true perception and understanding of cause and effect.—Metaphysics is "that portion of philosophy which treats of the most general and fundamental principles underlying all reality and all knowledge" (Maher[56], p. 520).—Psychology is "the science which treats of the soul and its operations"—and, therefore, clearly, must be the real foundation of Medicine.

§ 22. It is in modern scholastic philosophy that the student finds ample exposure of the fallacy in positivism and its cognates, enabling him to detect the difference between false and true, expressed with enough force of logic to satisfy the most meticulous. This queen of all the sciences amply proves positivist science (including Medicine) to be incomplete knowledge when taken alone. The knowledge of movement or change must be supplemented by mathematical and metaphysical view-points. (Cf. Mercier,[56], pp. 35, 36; and especially Wundt[17]: xii. et 35). Such men as Albertus Magnus and Roger Bacon were convinced of the necessity of linking the sciences with philosophy[17] (xii. 38).

When medicine has in this way become ennobled it reaches its highest degree of perfection, in that it penetrates to the very depths of reality[56] (p. 9), admitting this knowledge to need, even then, a further complement to make it complete—namely, knowledge in relation to God (" Christian wisdom ").

" Sapientia est scientia quæ considerat causas primas et universales causas. Sapientia causas primas omnium causarum considerat " (In. Met. I., lect. 2). " Ille qui cognoscit causam altissimam simpliciter, quæ est Deus dicitur sapiens simpliciter, in quantum per regulas divinas omnia potest judicare et ordinare " (Sum. Theol. II-II. q. 45, art. i.c). " Non acquiritur studio humano, sed est deursum scendens (*ibid.*, *ad* 2). " Cum homo per res creatas Deum cognoscit, magis videtur hoc pertinere ad scientiam, ad quam pertinet formaliter, quam ad sapientiam ad quam pertinet materialiter : et e converso cum secundum res divinas judicamus de rebus creatis, magis hoc ad sapientiam quam ad scientiam pertinet (*ib.* q. 9, a. 2, *ad* 3).

As St. Thomas[81] said in his day, " they think that nothing exists besides visible creatures " (C.G., ii. 3, l.p. 5) [N.B.—" Creatures " are (*a*) animate, (*b*) inanimate] ; " they think that things proceed not by the divine will but by natural necessity " (ib.). So even in those days time and fortune were expended on researches which sound philosophy would have shown to be inherently futile.

We may reflect for instance on the reiterated search for a location of the soul, which the pioneer anatomists prosecuted, and also on the commonly repeated announcement to successive students of anatomy that the pineal gland is now no longer regarded as the site of the soul. There is the sub-conscious suggestion to the student that scientific research has effectively disposed of the mediæval belief in the soul, whereas history only proves that the revolt against the precise teachings of the Council of Trent[16] (1545-1563) necessarily came to naught. The very definition of " soul " which this council laid down makes a search for its location ludicrous.

IV

SPECIAL DIFFERENCES BETWEEN THE CANON AND MODERN MEDICINE

A. Conceptions known to Avicenna; not now recognized.

§ 23. There are four main conceptions belonging to the Canon, but not recognized by modern Medicine. To use S. Thomas' words[83 84] (i. 32 ; art. 1 ; p. 270) they can be shown to be " not impossible " ; that is, the discoveries of modern science do *not* abrogate them.

These conceptions are relative to (*a*) the nature of the human being as a whole, (*b*) the constitution, (*c*) the "breath," (*d*) the "elements." Each of these is dealt with in some detail under the corresponding sections of the Canon, but some of the salient points are suitably referred to at this stage.

§ 24. (*a*) *The conception of the nature of the human being as a whole.*—The varieties of views on this point which people in every country and race exhibit both in conversation and in literature, numerous though they are, are capable of classification under one of three headings :

(i) The *first*—the *Platonic* view—regards the human being as "soul within a body," while admitting "soul" to be indefinable, and beyond the power of location. This view, widely supposed to be "Christian," is well known as "pagan" to students of folklore.

(ii) The *second*—the *scientific* or rationalistic and modern view—takes the physical body as the fundamental, seeing in it the outcome of known or at least knowable forces. The facts of anatomy, physiology, etc., convey their own inevitable conclusions. This view makes its immediate appeal. From the first lesson the pupil is able to feel a grasp of some tangible knowledge, whereas the alternative third view entails a long study before the intricacies of abstract philosophy can be mastered. The difference between experience and "poring over books" is only too obvious. The possibility of interweaving the two methods is not on the horizon.

In its answer to "religion," this scientific view has no objection to raise to its votaries retaining a private belief in the Platonic view, if their temperament demands it. But this "pious belief" must not be allowed to vitiate procedure when scientific research is undertaken.

This modern conception regards the body as an aggregate of "spare parts" which are "assembled" well, or ill ; can be repaired, or remedied. According as the assembling is good or bad, and according to the "fuel," so is there health, or susceptibility to infection by organisms. The kind of assembling is a matter partly heredity and partly of environment.

The following remarks in a review on a recent article in *Science*—by Lillie—may be quoted from the *Times*, Oct. 24th, 1927, p. 19. They present the idea in technical language :—

"Physiology finds the organism to be a nexus of physicochemical determination ; differing only from non-living systems in its complexity. . . . Speaking of freewill, one argument against 'indeterminism' is that 'the energy balance sheet of a man shows us there is no creation of energy within the body.' To assume will-power 'we conflict with Newton's first law.' . . . The ultramicroscope alone suggests indeterminism, and even this may be only because we do not know enough about Brownian movement, etc. Protoplasm is a 'heterogeneous system.' In heredity submicroscopical units determine the details of inheritance—but an event originating in an ultramicroscopic particle can spread to the whole cell or organism. On this view, a human action appearing entirely spontaneous and voluntary to the actor and spectator would exhibit itself as a succession of mechanically determined events capable of study and prediction in all its microscopic details. But traced inwards it would ultimately resolve itself into certain ultramicroscopic events in the interior of the nerve-cell." But "even the freedom of the ultramicroscopic particle may be no more than a subtler kind of determinism beyond the reach of present analysis." §64 contradicts these remarks.

It may be noted, in passing, that the doctrine of vitalism is really only another form of rationalism, as will appear when the scholastic doctrine is duly investigated.

§ 25. The *third* view—*scholastic, Thomistic*—presented by modern scholastic philosophy, has the Aristotelian basis. Its soundness is best appreciated by careful study prolonged until the prevalent inadequate and illogical conceptions of the universe are clearly exposed. Briefly, the view is expressed in the words : " the human being is a material body vivified by a life-principle, the two together constituting the rational human soul." As S. Thomas [84] says : "It is not my soul that thinks, or my body that eats, but ' I ' that do both " (p. 25). In other words, again : *The body and " soul " form one complete whole—one " single being "*[38] (p. 53) ; [56] (p. 302, 306).

It is this view which underlies the whole Canon, and is expounded in connection with the corresponding parts of the text. It is this view that makes the ancient work fall in line with the most " modern." Its consequences are far-reaching. The external configuration of the body, including the physiognomy, is a reflection of the functional capacity of the internal organs and general make-up of the individual. The character, talents, physical form, shape of individual features, general development, and indeed every detail of the physique, length of limbs, of fingers, cutaneous markings, contour of the eyes and ears, etc., are all part and parcel with the functional conformations of the viscera, and the mental characters ; a study of the visible will inform of the nature of the internal conformation. (Cf. **107**)

§ 26. The idea that from a study of external features and general habit one should deduce conclusions as to functional capacities* is generally opposed by academic Medicine ; as is voiced by F. v. Müller (1921, quoted by Kolle, Mitt. Ggeb. Med., 1926, 40, 371) when he says " we must steadfastly avoid drawing any far-reaching conclusions about the functional behaviour of the organism from a study of the external characters of the body."

While it may be urged that the external features are usually misread, it may also be admitted that even the customary " physical examination " of a patient does not yield uniform results when practised, as it necessarily is, by persons of varying talent. Surely, the remedy is to exert greater care. We may, for instance, observe how a skilled weaver will detect the site of a flaw in the " set-up " of a loom by a mere glance, whereas a novice discovers it only after laborious search. See § 163.

On the other hand, the biochemical tests for functional capacity of organs—so much the vogue, and so much exploited, and so duly impressive on patients and their friends—are clearly inadequate in the light of the scholastic doctrine. It is true that the attempt to force the intangible to yield to mathematical formulæ, rules, and weights and measures (as, for instance, in blood-cholesterol analyses) is sincere enough, to judge by the time, energy and money expended so freely. But what is to be the verdict once it is realized that the anatomical organs are not functionally discrete or amenable to distinctive " specific " tests ? A just appreciation of the intimacy of relation inherent in the conception of the human being insisted on here suffices to show the futility of those labours and studies whether made upon man or upon the various orders of animals taken instead.

More than this, there is the conception that the internal organs belong to one another beyond the anatomical limits. The heart, to anatomy, is a circumscribed organ ; to Avicenna it is part of a force occupying the whole body. " Man's heart is both corporeal and incorporeal " (Chu Hsi[10], i. p. 162). So, again, the liver is simply a visible portion of a " liver " whose operation pervades the whole body.* Or, to combine modern with ancient knowledge, the physical heart, the arterial vessels, and the sympathetic nervous system, including the connections between this and the sensorium and that which corresponds to the "sensitive soul" in its emotional aspect, for instance—all this is one great composite; and its state is also reflected in many subtle indications which offer themselves to the keen observer of the patient.

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* The relation between character and physique was scientifically studied by the Chinese 450 B.C. (Cf. Wieger.)

The modern research on diseases of the brain and insanity is based on the assumption that the material brain is the source of all nervous activities, which are correlated with definite biochemical, physicochemical and even structural changes in brain substance. Mental disease is the outcome of similar changes. The Platonists would consider mental disease as apart from the "soul." The Thomistic view leads to much more subtle conclusions, capable of lasting influence.

(*b*) *The doctrine of "the constitution."*

§ 27. The term "constitution" conveys different ideas to different minds. The laity regard the term as synonymous with "temperament" or "make-up," at least in part, and consider a description of a patient as having a nervous temperament, a delicate constitution, etc., quite adequate. With this goes the conviction among the lay that the medical curriculum leaves the graduate fully able to "understand his constitution" whereas in actual fact the subject is never discussed. The study of physique is quite superficial, and is admittedly made solely to establish a diagnosis of specific "diseases." Hence the term, in conversation, is actually nothing more than platitudes.

To modern medicine, regarding the body as corporeal, constitution is a matter of physique, resistance to disease, mode of reaction to various stimuli (including psychic stimuli). Classifications of varieties of constitution on this basis are afforded by various writers in all countries—e.g., a classification into athletic, leptosomic and dysplastic; into arthritic, endocrine, lymphatic, asthenic, infantilistic, chlorotic, etc. (Current medical journals).

In the Canon, Avicenna establishes "constitution" in terms of humours, temperaments (hot, cold, dry, moist) and "elements" (whose proportions are set for every individual.—**47**). If we go further, and apply to this term the method which Rumi [37] (p. 169), the great Persian sage demanded of students of the Quran, we shall not regard a patient's constitution as understood until we have studied the matter much more intimately.

> "Know the words of the Koran are simple,
> But within the outward sense is an inner secret one.
> Beneath that secret meaning is a third,
> Whereat the highest wit is dumbfounded.
> The fourth meaning has been seen by none
> Save God, the Incomparable and All-sufficient.
> Thus they go on, even to seven meanings, one by one,
> According to the saying of the Prophet, without doubt."

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* Cf. Paracelsus, de viribus membrorum (Hartmann, p. 219).—Moreover, each individual "is a member of the great organism of the world" . . . "not a separate being isolated from Nature." (Ib. p. 51). Individual : human world : one leucocyte : one human being.

" I know," said Tawaddud, the lady most learned, " the sublime Koran by heart and have read it according to the seven, the ten, and the fourteen modes " (438th Arabian night).

Therefore, to draw a lesson for our study out of these indications, we shall see that the aim in view is to formulate a person's constitution out of a number of components, none of which must be omitted from the series. To express the whole picture many modern aspects must be studied—histological, biochemical, psychological, without neglecting factors (metaphysical, etc.) accepted by the ancients but almost forgotten to-day. For instance, the past events in the ancestral history of the patient must be included, and all the factors coming into play even from the time of quickening may not be overlooked.

The insight afforded by the true conception of the nature of the human being in this way leads us on to an understanding of individual constitutions which should be amply satisfactory.

(*c*) *The doctrine of " the breath."*

§ 28. This subject is discussed in the course of the text (§ 136). The term " breath " found in Eastern writings is taken as the *exact* equivalent of Avicenna's conception, and is understood properly only when the " elements " are understood (see § 73).

Equivalent terms : life-principle ; ḥayat ; حيوة ; the breath of life ; virtus vitalis ; spiritus ; vitality ; Hu (in Persian mysticism*) ; Ch'i 氣 ; nafas (also used for " soul," " individuality ").

It may be conceded that many of these words are used synonymously with much confusion in consequence. Thus the old doctrine of vitalism, supported by vitalists, is not the antithesis of, but strictly speaking, another form of rationalism. In Paracelsus we read " the first matter of the elements is nothing else than life. . . . The soul of the elements is the life of all created things. . . . There is again a difference between the soul and the life. Fire if it lives, burns. But if it be in its soul, that is, in its element, it lacks all power of burning " (Opera ii. 264). Errors of this kind are avoided by a careful study of the scholastic philosophy.

(*d*) *The doctrine of " the elements."*

§ 29. This is fully entered into at the end of the corresponding chapter in the translation (§ 55—108).

The conception of the universe in terms of four, or five, elements has been found among all peoples. To argue in favour of the doctrine almost compels an attempt at harmonization of its different forms (Aristotelian, Indian, Persian, Chinese, for instance). Suppose a number of people each set out to paint one certain landscape ; that each is of different nationality ; that each is restricted to a certain limited number of pigments ; that each is a true artist. The final picture presented by each will be striking and inspiring. But it would be out of place to begin and compare stick with stick and stone with stone. If we understand, we shall learn—from each. The modern futurist may excite ridicule in his attempts to depict a landscape in terms of psychic forces, which he claims to discern, but to the mind of a student his work would have a different effect. These varying forms of one conception are amenable to intelligent understanding. (Cf. note to **20**.)

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* Hu, in Chinese, 呼, is not the exact equivalent, through being used more for the act of expiration—unless there is a mystical sense attached to the term.

§ 30. Carus[15] (p. 34) writes: "An explanation of the universe which derives all distinctions between things, conditions, relations, etc., from differences of mixture must have appeared very plausible to the ancient sages . . . even to-day Western scientists of reputation attempt to explain the universe as a congeries of force-centres, acting either by attraction or repulsion in analogy to positive and negative electricity. On the ground of this fact the educated Chinese insist with more than a mere semblance of truth that the underlying idea of the Chinese world-conception is fully borne out and justified by the results of Western science." Elsewhere the intimacy, in fact unity, between this philosophy and everyday life (Forke,[23] pp. 239, 260) is referred to as the justification for so often quoting Chinese thought in expounding Avicenna.

B. Conceptions known to modern medicine; but not to Avicenna.

§ 31. Among the most important of these are:

(*a*) the anatomy of the circulation of the blood. (*b*) the rate of that circulation. (*c*) The details found in Quain's anatomy; the microscopic anatomy; such complexities as form the theme of Bayliss' Physiology. These details might be expressed as those of "the mechanics of the body." (*d*) Interactions in the tissues: chemical and cellular metabolism. (*e*) In *pathology*—the microbic theory; the endless and always increasing number of "diseases"; the laboratory diagnosis of dysfunction of organs; (albuminuria was, of course, unknown); symptoms as evidences of disordered reflexes. (*f*) In *treatment*: the use of antisera and specific anti-substances of organisms; hypodermic medication; complex drug treatment has passed out of vogue. Surgery.

§ 32. Considerations which suggest that these instances of ignorance are not as grave as is supposed, and do not invalidate the standing of ancient medicine in regard to actual practice:—

Ad (*a*). Circulation of a kind was propounded in the case of the "breath," the elements, and the body-fluids, though not along anatomical channels. The Chinese recognized a process of "revolution," a succession of cyclical changes, an ebb and flow. Indeed, it is suggested in Duhalde[20] (p. 184) that the Chinese knew of the circulation of the blood itself some hundred years B.C.

Wieger (p.309, on Su-Wên), discussing whether the Chinese knew of the circulation of the blood twenty centuries before Harvey or not, decides truly that "their knowledge of the circulation of the blood in the human microcosm was intuitive, not experimental, conjectured in imitation of the circulation of the vital principle in the universal microcosm, in which they believed. They guessed the fact, and they never verified it. . . . During more than twenty centuries, the *how* of the guessed circulation never worried their mind. The yin-yang circulates in a ring, the five agents do the same, the blood the same. That is all . . ."*

Ad (*b*). The rapidity of the changes was certainly not realized. The Chinese apparently believed that the circulation was completed only fifty times in one day (there is however room for fallacious translation).

Lest there should be over-satisfaction with ourselves, it may be suggested that the rapidity of the movement of the *lymph* was not realized before about 1908, and is perhaps not fully realized by many practitioners to-day; the rapidity of passage of food-materials down the small intestine was not known till the advent of the "bismuth" meal. The circulation of bacteria (cf. Arch. Exp. Med., 1923, 33) is not realised; the existence of a circulation of nerve-impulses is not yet admitted.

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* But if a doctrine which is common to Taoism and esotericism (that of microcosm and macrocosm) is allowed to be valid, the words "intuitive knowledge" cannot be made synonymous with "conjecture," "guess."

Ad (*c*). The *capillaries* of the liver are referred to in **83**; in the body in general in **85**. True, what Avicenna calls capillaries are larger than those we see with the microscope. But he knew that the blood passes from large trunks into the liver, traverses "capillaries" in the liver, and re-emerges by large trunks.

Ad (*d*). Interactions in the tissues were conceived of as taking place with an ebb and a flow (which is correct); lymph exudes into the tissue-spaces. Interactions take a considerable time (true). Digestion goes on within the blood-vessels in various parts of the body.

Ad (*e*). "Fermentation" was the counterpart of bacterial growth as we know it. The term is used sufficiently specifically in the text (e.g. **78**, **79**). Diseases were regarded chiefly as parts of a *process*; and there were but few processes (which is quite true: nine processes: see § 172). Urinalysis was carried out in order to assess the functional state of the liver (**605**).

§ 33. *Ad* (*f*). Modern medicine claims its title to superiority by its successes, and judges the medicine of the past by its failures.* But what would the judgment be if this method were reversed? Suppose we accepted the verdict of those among the laity—not so few—who are dissatisfied with their experiences of orthodox medicine and have turned to the "unqualified" of one kind or another? or those of other countries who prefer their native doctors still? or even those Europeans who have experienced triumphant success from native doctors, after modern methods had failed? After all, the ancient medicine is still practised from Cairo to Calcutta, and a medicine not very different holds sway through the Far East. The late Sir Charles Pardy Lukis (Ind. Med. Services) is quoted as saying "Many of the empirical methods of treatment adopted by hakims are of the greatest value, and there is no doubt whatever that their ancestors, ages ago, knew many things which are nowadays being brought forward as new discoveries (Ayurveda, 1924, 2, i. l).

Drug-treatment.—The complexity of prescriptions of former times has given place to simple and short ones, and the tendency is to discard them altogether. But the reasons for the ancient method are given in the Canon, and Avicenna's choice of remedies depended on a careful consideration of the constitution of the remedies, as well as of the patient and his idiosyncrasies. Thus, certain ingredients would be allowed or disallowed in a given standard confection according to the nature of the particular patient. "The presence or absence, and the amount, of nardus, ginger, fennel-seed, anise, piper, cyperus rotundus, must be according to the season, and the age of the patient " [89] (p. 91).

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* In his address, "Medicine and the Church," already referred to, Sir Farquhar Buzzard[103] says, "During more than 5,000 years the claim of those who practised medicine was to cure their patients of disease . . . we have gradually realized that no claim of that kind can be maintained . . . we make no claim to cure, either during the heat of battle or after victory has been won, should that be the result." This "modest standpoint" can surely hardly be said to be really general?

§ 34. Hartmann[28] (Chinesische Heilmethoden, Münch, Med. Woch., 1927, June 3rd, 935) describes the accuracy of native diagnosis (from the pulse. § 204) as "disconcerting,"* and describes certain forms of treatment (auto-chemotherapy, Bier treatment) as being practised in a manner only different in outward appearance from the technique which we pride ourselves as being absolutely the "latest." "No wonder," he says, "that the Chinese are proud of their art, considering how long they have known that which we have only recently discovered."†

§ 35. The cynical mind cannot be upheld which passes off the reputed successes during the Middle Ages as coincidences, and overlooks the modern crowded out-patient departments as evidences of the limitations of our current therapy and theory ; nor can the sceptic be much noticed who denies miraculous cures rather than admit scientific theories to be in any sense inadequate.

§ 36. Nevertheless, it is obvious that the principles of the Canon could not be taught over a hospital bed or in the out-patient department. It is true that they cannot cater for the wholesale requirements of the hospital or clinic. It should be clear to the candid that our modern technique does not avail for 100 per cent. of cases ; for those who do not benefit at least an experiment with other systems of treatment should not be denied. If the fault is laid at the feet of over-strenuous routine work, the more leisured may yet find an advantage in a system which puts the details of a person's constitution in all its aspects into the forefront, where there is no question of teaching it either to classes or even to possibly indifferent individuals. The words of Paracelsus may be recalled, where he says : "the doctor who loves his art does not undertake twenty cases but five, knowing that no one person can conscientiously treat more than a certain number. No one person could ever make the whole world sound."

C. *Knowledge common to Avicenna and Modern Medicine.*

§ 37. A perusal of the text of the Canon will show many passages which apply quite well, without explanation, in these days. Thus, the following may be specified : the close relation between emotions and physiological states (shown to be even closer than modern research has realized).—The classification of people into sanguine, phlegmatic, bilious, saturnine, frigid, "hot."—The physiology of sleep, and how posture may remedy insomnia.—

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* The same wonder at their practice is recorded in A.D. 1253, when the friar William of Rubuck visited their country.

† These words can be fully endorsed, if only from a study of the Chinese classic on the pulse[98] (80 volumes), discussed under the heading of "The Pulse" in the present treatise (§ 208). Among other ancient Chinese medical works (first seen by the present writer in the very extensive collection in the Library of M'Gill University, Montreal) reference may be made to the astonishing accuracy of representations of medicinal and other plants, and the almost dramatic representations of various diseased states in the *I tsung chin ch'un* by *Hung Chou*—extant in Avicenna's time. This work was reprinted between 1904 and 1924, and an older edition is in the Library of the School of Oriental Studies (London Institution).

Choice of location for dwellings.—The choice of a good drinking-water.—Health resorts. Climatic influences on health and illness—Plethoric maladies.—Dietetics.—Hydrotherapy.—Regiminal treatment.—The uses of counter-irritation.—Bier treatment.—The introduction of remedies into the urethra.—The use of vaginal tampons.—The use of anæsthetics by the mouth (medicated wines: scopolamine!).—Testing the strength of a drug by animal experiment (Vol. 5).—The treatment of insanity by malaria (**228**).—The following paragraphs are interesting among many others: **106**, **115**, **255**.

No doubt the great difference between the ancient and modern is one of outlook, which accounts for the difference of *topic*. That which appeared interesting and even important in those days is passed over by modern physiology and pathology. Each century has its own interests. The mistake made is to suppose that the older interests were "wrong," "incorrect," "useless"; and to label them as "out of date." True, fashions of all kinds come to be out of date, but the epithets "right," "wrong" do not apply. The more carefully we observe modern science the more evident does it become that just its terminology and subject of conversation is different. Things are seen from new angles, and things only surmised at then are amenable to tangible description now.

In fact, there occur moments, even at this day, when suggestive thoughts might be drawn from the Canon, to help in studying the individual, tedious, or baffling case, especially where the practice is far distant from the laboratories and appliances of modern medicine.

V

Of Interest to the Scholar.

§ 38. The present translation is based on the Latin versions published at Venice in 1608 and 1595, supported by a study of the Arabic edition printed at Rome in 1593 and the Bulaq edition.

It is true that as E. G. Browne[6] (p. 34) pointed out, "the Latin Qanun swarms with barbarous words which are not merely transcriptions, but in many cases almost unrecognisable mistranscriptions of Arabic originals," and that Hirschberg and Lippert[30] regard the Latin as almost unintelligible, though they admit the "slavish adherence" of the Latin to the Arabic. Campbell[12] (p. 139) states that there was a "society of translators" at Toledo, about 1130 A.D., "whose method of translating from Arabic to Latin was to put the Latin equivalent over the Arabic words, disregarding the sense of the original." It is true that in many passages the obscurity is similar to the effect which would result if one were at this day to render idiomatic French word for word into English.

It is important to point out that the Latin of Volume I is very different from that of Vols. III-V; so different that the translation must have been the work of different persons. While the criticisms are justified with regard to these three volumes, they do not apply to the first, whose Latin is very close to the Arabic, and hardly to be improved. The difficulty really is that the Arabic itself is so condensed that the meaning can only be clearly represented in English by the use of many more words, whether to help out the meaning itself, or to make a presentable reading.

It may well be said, as did E. G. Browne[6] (p. 26, 27): " he who judges Arabian Medicine only by the Latin translation will inevitably under-value it and do it a great injustice. Indeed it is difficult to resist the conclusion that many passages in the Latin version of the Qanun of Avicenna were misunderstood or not understood at all by the translator, and consequently can never have conveyed a clear idea to the reader."

§ 39. The following aids to clearness have been utilized. (*a*) The study of Avicenna's other works, and of contemporary philosophical writings, in the existing translations. (*b*) The study of various Latin terms as understood by modern scholastic philosophy in its exposition of the mediæval nomenclature. (*c*) The use of modern terms when there is no reasonable doubt of their referring to the same idea, though the literal term in the Latin is obsolete. The careful study of the original Arabic has here been of special importance, for words in the Latin version, which are evidently technical there, become merely colloquial when translated into English, whereas in the Arabic version, such words at once take on their proper character in the Arabic-English and Persian-English dictionaries. (*d*) The use of tabulation of the matter. There are instances where this proves possible without omitting even a single Arabic word. (*e*) The use of paraphrase for certain passages. These are marked (*p*). A certain freedom of rendering has been inevitable in view of the importance of bringing the *full* meaning of the text to the reader's notice without subjecting him to the need of reflecting deeply on passage after passage—as is requisite with the original Arabic.*

VI

§ 40. The main purpose of this treatise will now be seen to centre in the idea that in the ancient philosophy there is material capable of useful application to-day. The selection of the work of Avicenna is not intended to provide an apologium for that one author, but is specially appropriate for these reasons: (i) his acknowledged excellence; (ii) his greater accessibility among mediæval medical writings; (iii) a certain indefinable charm of expression peculiar to himself. But above all, (iv) the fact that his central theme is a conception of the nature of the human being really identical with that of Thomistic philosophy, and in these days specially stressed and developed by " modern scholastic philosophy." As these are related, so might Avicenna be related to a modern scholastic medicine, which would aim at reasons for health and ill-health far deeper than those given by the microbic and cognate theories.

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* To have dealt with the work from the point of literature would have entailed giving the preference to safeguarding against likely criticisms at the hands of pure scholarship.

With Mercier[56] " we do not regard the Thomistic philosophy . . . as a boundary which sets limits to personal activity of thought . . . but make use of his " (in this case, Avicenna's) " teaching as a starting-point from which we may go further afield " (footnote, p. 31).

With Maher [50] we " . . . resuscitate and " (apply to Medicine) " . . . a psychology that has already survived four and twenty centuries, and has had more influence on human thought and human language than all other psychologies together. My desire, however, has been not merely to expound, but to expand this old system . . . to make clear to the student of modern thought that this ancient psychology " (and Medicine) " is not so absurd, nor these old thinkers as foolish, as current caricatures of their teaching would lead one to imagine. . . . To trespass (on the soul) . . . is assumed by (many writers) to be the gravest of professional delinquencies."

§ 41. Therefore Avicenna is allowed once more to present his theme. To the questions we are constrained to ask of him, we find our answers (1) in his other writings ; (2) in contemporary literature ; (3) in the writings of modern Eastern thinkers ; (4) in the works of S. Thomas ; (5) in modern scholastic philosophy. If some truths are crudely expressed or perhaps faultily explained, it is our privilege to re-express and re-explain with those aids.

§ 42. Those who may have failed to identify one single Truth under different garbs are not obliged to accord these garbs an unfriendly reception upon the stage of our modern world. To recall a favourite Indian metaphor, the danseuse has so robed herself, and displays such diversities of art that under the ever-changing coloured beams of light it is difficult to believe there can be only one and the same artiste before us. Should it prove impossible to verify this, at least the very exhibition of the art should serve so to refresh that we can resume our work and ambitions with an added zest—now confident that the future realization of our desires is not so intangible as at first appeared.

" I deemed life was tranquillity and rest,
I find it but a never-ending quest ;
And I, who sat in quietude and peace,
Toil on a journey that shall never cease." (Shamshad.[29])

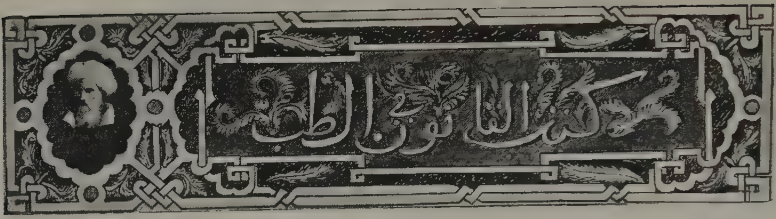
" Why should the Cosmos turn its wheel of worlds
If not to search for Thee eternally ?
Why should the tireless Sun arise each morn
If not to look for Thee ? " (Zauq.[29])

" How can I win that Hidden One Who sits within the secret place,
For even in my very dreams She wears the veil upon Her face." (Jurat.[29])

" For long, throughout the world, I sought for Thee,
Through weary years and ages of unrest ;
At last I found Thee hidden in my arms
Within my breast ! " (Zauq.[29])

§ 43. That which is spread before us, beneath the unceasing surge and change of the crowded life of the thoroughfares of great cities, as well as beneath the panorama of Nature herself, was surely understood by those who insisted " there is no second Cause," and by Chu Hsi[11] in saying " the innumerable laws (of Nature) all proceed from one source" (p. 137). In this the thought is not pietistically of a Creator, but of a living Reality met (passively or receptively) or encountered (actively or contestingly) by us all at all times. That Reality must be understood before we handle the problem of our patient with real efficacy.

§ 44. In the intention of this work, then, there comes into consideration that greater Art of Medicine—not an ethical Hippocratic ideal, but something of the divine—an Art as real to Avicenna, philosopher, poet, musician, the worker among the great and the small, aware of the dramatic in Life, as it should be to us. So we step out of the world of the modern critic, the scholar, and the medical historian, indeed of modern medicine itself, into one in which we stand, as it were, hand in hand, with the great Master of the East—almost with his very eyes gazing upon and scrutinising this ever open book of Life of ours—divested of the false notions of " progress " and "time." His language is thus no longer alien—and, incidentally, he lives again !



Introductory Words

IN the first place we render thanks to Allah, for the very excellence of the order of His creation, and the abundance of His benefits. His mercies are upon all the prophets.

2. In the next place, I may say that it is at the request of one of my very special friends,* one whom I feel most bound to consider, that I prepare this book on Medicine, setting forth its general and particular laws to the full extent necessary, and yet with apt brevity.

3. My plan is to deal with the general aspects of each of the two divisions of medicine—the speculative and the practical. Then I shall treat of the general principles applicable to the diagnosis of the properties of the simples, following this with a detailed account of them. Then I shall take up the disorders which befall each individual member, beginning with an account of its anatomy, and that of its auxiliary. The anatomy of the several members and their auxiliaries is dealt with in the first book. Having completed the account of the anatomy, I shall show how the health of the member is to be maintained.

4. This subject being completed, I proceed to a general discourse about general diseases—their causes, the signs by which they are recognized, and the modes of treatment. After this, I pass on to the special diseases and will point out in as many cases as possible—(i) the general diagnosis of their characters, causes and signs, (ii) the special diagnostic features,

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* Was it Al-Jūzjāni ? (cf. E. G. Browne,[7] p. 157).

The portrait in the heading reproduces a painting in oils hanging in an ante-hall of the Seville University.

The designs in this and many other headings through this work are adapted from or copied from, Arabic and Persian sources. For others, taken from manuscripts, etc., the author is indebted to the kindness of Messrs. Luzac & Co. Initial letters are taken from the 1608 edition in Latin, the 1523 edition of Haly Abbas, and various mediæval illuminated books.

(iii) the general rules of treatment, (iv) the special methods of treatment by (*a*) simples, (*b*) compounded medicines.

I include specially designed tables under the subject of simples to enable you to survey the facts rapidly as to the adjuvants for treating disease by simples.

Compounded medicines, and their adjuvants, and how to mix them I have deemed it best to consider separately in a "Formulary." This it is my intention to compose after the special subjects are dealt with. Disorders not confined to one member are described in this book; the cosmetics are spoken of; and the knowledge set forth in previous books is assumed. Allah helping me to complete this volume, the formulary will be added to it.

5. Every follower of my teachings who wishes to use them profitably should memorize most of this work, even though he do not quite understand it all.

It is my intention to prepare further volumes if Allah should prolong my life still further, and if circumstances prove propitious.

Scheme of Contents

Book I. General matters relative to the science of medicine.
  1. The definition and scope of medicine. Health.
  2. The classification of diseases; their general causes and symptoms.
  3. The preservation of health and reginimal treatment.
  4. The classification of the modes of treatment in general.
Book II. Materia medica.
Book III. Special "pathology" (Medical and Surgical).
Book IV. Special diseases involving more than one member. The cosmetic art.
Book V. Formulary.

CONTENTS OF BOOK I*

Part 1 comprises six theses:—
  1. The definition of medicine. The topics of medicine.
  2. The imponderable elements.
  3. The temperaments and constitutions.
  4. The fluids of the body, and how they arise.
  5. The members (bones, muscles, nerves, arteries, veins) (= tissues and organs).
  6. The faculties of the body: vegetative, sensitive, vital. The power of locomotion. The functions and operations of the body.
Part 2 comprises three theses:—
  1. Ill-health:
    (*a*) Causes, symptoms.
    (*b*) States of the body; types of disease.
    (*c*) Disorders of configuration.

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* The Latin text is abridged here.

    (*d*) Loss of continuity.
    (*e*) Diseases of the composition.
    (*f*) Disfigurements.
    (*g*) The phases or cyles of disease.
2. The causes of disease :
    (*a*) Atmospheric, seasonal, winds, localities ; the sun.
    (*b*) Vegetative functions.
    (*c*) Food and drink.
    (*d*) Other factors.
    (*e*) Enumeration of the causes of each of the corporeal conditions.
3. The evidences of ill-health in (*a*) the pulse, (*b*) the urine, (*c*) the fæces.

PART 3 comprises five theses :—

1. Nutrition. Regimen from birth to childhood.
2. Regimen from childhood to old age ; Exercise, gymnastics, bathing, dietetics, fatigue.
3. Regimen for the aged.
4. Regimen appropriate to the various constitutions and habits of body.
5. Seasons.

An epitome giving the regimen in special circumstances of life.

PART 4. The treatment of disease.

(There are 263 chapters in all.)

بسم الله الرحمن الرحيم

" In the name of Allah, the Merciful, the Clement."

BOOK I

" Whoever has mastered the first book of the Qanun, to him nothing will be hidden of the general and fundamental principles of medicine."—*Chahar Maqala.*[1]

Part I

THESIS I

1. THE DEFINITION OF " MEDICINE "

MEDICINE (**6**) is the science by which we learn, (*a*) the various states of the human body, (i) in health, (ii) when not in health, (*b*) the means by which, (i) health is likely to be lost, and (ii) when lost, is likely to be restored to health. In other words, it is the art whereby health [the beauty of the body—long hair, clear complexion, fragrance and form (Chahar Maqala)] is conserved and the art whereby it is restored, after being lost.

7. Although some divide " medicine " into a speculative (theoretical) and a practical (applied) part, you have assumed that it is wholly speculative " because " you say " it is pure science." But truly every science has both a speculative and a practical aspect. Philosophy has a speculative and a practical side. So has medicine. The difference between the two need be explained only in the case of medicine. Thus—

When, in regard to medicine, we say that practice proceeds from theory, we do not mean that there is one division of medicine by which we know, and another, distinct therefrom, by which we act. We mean that these two aspects belong together—one deals with the basic principles of knowledge ; the other with the mode of operation of these principles (within the body). The former is theory ; the latter is applied knowledge.

8. "Theory" of medicine is that which, when mastered, gives us a certain kind of knowledge, apart from any question of treatment. Thus we say that "there are three forms of fever and nine constitutions."

9. "Practice" of medicine is not the work which the physician carries out, but is that branch of medical knowledge which, when acquired, enables one to form an opinion upon which to base the proper plan of treatment. Thus it is said : "for inflammatory foci, the first agents to employ are infrigidants, inspissants, and repellants ; then we temper these with mollificants ; and, finally, when the process is subsiding, resolvent mollificants will accomplish the rest. But if the diseased focus contains matter which depends for its expulsion on the integrity of the principal members, such treatment is not applicable. Here the theory guides to an opinion, and the opinion is the basis of treatment.

Once the purpose of each aspect of medicine is understood, you can become skilled in both, even though there should never come a call for you to exercise your knowledge.

10. Another thing—there is no need to assert that "there are three states of the human body—sickness, health, and a state which is neither health nor disease." The first two cover everything. Careful consideration of the subject will make it clear to the physician either that the threefold grouping is unnecessary or that the group which we reject is unnecessary.

The first two states really cover everything. Careful consideration will convince the physician that the third state is dual—on the one hand an infirmity, and on the other a habit of body [some ugliness of form, for instance] or a condition which cannot be called strict health although the actions and functions of the body are normal. One must not risk defining "health" in an arbitrary fashion, and include in it a condition which does not belong to it (*p*).

However we do not propose to argue this matter out, because a disputation of that kind does not really further medicine.

§ 45. Joannitius[11], Ḥunayn ibn Isḥāqal-ʻIbādi (E. G. Browne[7], p. 147)—defines Medicine as " the science which informs us about the states of the human body in health, or when it deviates from health ; how to retain health ; how to regain it."

It is concerned with the following :—

1. That which is integral in the *nature* of the human being. The seven "notes" of the healthy human being—four being material, essential, and three formal. The four " accidental " notes.
2. That which is apart from the *nature* of the human being.
3. The præternatural or abnormal, to which belong the diseases, their causes and signs.

* * *

§ 46. The Scope and Definition of Medicine as a Profession ; the motives underlying.

1. Medicine as an exterior Life or Career.

(*a*) *The pursuit of a science.* Medicine may be taken up as a science in itself, for the sake of science—namely, " that science which treats of the prevention or cure of disease." . . . This work entails the study of cognate sciences. Love of knowledge may be the chief motive ; that is, it is an intellectual pursuit ; though other motives may be associated.

Many branches of medical science are separated off as distinct pursuits—external, internal, state, psychological, pathological, legal, medicine, etc. As a Career, it may be orthodox, that is obedient to the laws about practice, etc. ; in which case it is also obedient solely to the microbic theory of disease—or unorthodox in various degrees, through following different " systems," many of which are unauthorized, and lead to some form of illegal practice.

If Medicine be regarded as concerned with the nature and constitution of man (as a matter of the first importance in learning how to maintain health and alleviate the distresses of ill-health), it is defined virtually in the same way as Avicenna, and conforms also to modern scholastic philosophy. In this case the practitioner would centre his attention on the individual, the patient himself, rather than on some disease or infection, or over and above the disease or infection ; the constitution being primary in causation.

(*b*) *The pursuit of a practical art.* The scientific aspect is here made subsidiary to practical utility and success.

(i) In its primary motive, this form of pursuit is of course the pursuit of a livelihood, and medicine is a form of commercial life. Its success would then be measured by the bank balance. Admittedly this is seldom of the degree called wealth. After a long life of hard work, such a one might grieve at his lack of success did he not simultaneously have motive (ii). For these words then apply : " The only compensation which medicine offers to wealth is the spiritual pleasure of sacrifice, that solemn sweetness which floods our being when we see the fruit of our pain. The dependence of the soul on the Creator, brings our obligation to Him in dealing with those under our care. This is what makes the weary dispensary clinic blossom with a fullness of solace surpassing all expectations" (Flagg.[22])

(ii) Pursuit primarily for humanitarian motives—the alleviation of suffering, especially of physical pain ; and of various disabilities. (The actual cure of disease is often supposed to be within human scope, though an impartial judgment must surely modify such an idea.) Preventive medicine is based on the same motives.

§ 47. 2. Medicine as an interior Life. Motives in the strict sense.

(*a*) " *Worldly motives* "—pursuit as a means of satisfying a certain egoism or ambition on the part of the doctor himself or of his relations ; pursuit as a trade or business.

(*b*) *As a form of devotion to Fellow-man.* Philanthropy. (i) The relief of pain, disability, suffering, etc. (ii) Socio-political motives—the efforts of legislation and research : sanitary medicine ; state medicine. Industrial medicine. Organization of " team " work both for research and the " panel." The devotion is more to

Man in the abstract, the individual not receiving personal contact, as he does under (i).

(*c*) *As a form of devotion to God.*

(i) The study of medicine may be made the means of studying God both in Nature and in Man, and indeed in all Life, to perceive the purpose of God therein.

(ii) The pursuit of practice (*a*) as a penance or means of mortification " in the cell of your heart." So, Avicenna the Sufi seeing through the Quran how daily life is a disciplinary (Massignon,[63] ii. 515). (*b*) A means of reaching personal perfection. " Every soul is on the way to sanctification, after all, and God leads each according to the means He selects as best " (Tanquery,[64] p. 976). This is the practitioner's " unitive way." To achieve one single act in the whole life would be to achieve the desire. (*c*) A means of realization of the love of God. " The fear of the Lord is the beginning of wisdom " (Medicine as a " religious life " being capable of inclusion under this title)—culminating, not through personal will, but through divine will, in a consciousness of the presence of God throughout every organ and tissue, so that the *state* (" *Hal* ") of recollection may finally become actual. (*d*) A means of expiation. It is possible that expiation may be accomplished through the instrumentality of the physician, and without his being aware of the fact. He may be the instrument whereby the patient is released from illnesses arising from causes indicated in § 199. On the other hand, he may fulfil a deeper intention, especially when both skill and devotion are great, for in him the devotion of God to man may become capable of expression,—he may become the vehicle of God's intention. As the master virtuoso is just one voice of God heard from among the sea of musicians, and is only able actually to utter one or two of the voices of thousands of composers in his recital, so also is the utterance of that expiation rare and restricted. One wave alone comes into prominence and then breaks, but it is with thorough purpose, not at random. Even so, God, in that wave, may wish to express Himself in that manner if only once and through one individual in one generation.

§ 48. This, the highest aim of the pursuit of medicine as an art receives a dual reward : the subtle intangible but far-reaching influence upon the patients, benefiting them unknowingly ; the influence upon the physician by the spirit of divine love whereby is imparted the gift of *insight* into the realms of absolute realities—into that which underlies deeply the appearances of this kaleidoscopic world ; the gift of *ability to counsel* the patients along the road of their own life, whereby those for whom this counsel is intended shall proceed towards the common goal of Man. Neither physician nor patient may be conscious of this gift. Yet the former may recognize in the illnesses or persistent ill-health some *decree*, some divine purpose related to that particular soul, which it may be for the physician to intervene or not, whether he perceives the holy ground on which that patient momentarily stands or not. No treatment will cure till the expiation is accomplished.

To the despondent and over-tired and weary practitioner, these motives reveal the same life and vision of Paradise as belonged to the author of the Canon ; once viewed, its warmth and happiness may still accompany him as he resumes his daily round, and thereafter his enforced departure upon the tasks of the day need evoke no sigh of regret.

As Ibnu 'l-Farid (A.D. 1182-1235) reveals in his Taᶜiyya[62] (p. 180), there is the power of lifting oneself into the sphere of the infinite and eternal, whereby the daily task becomes transformed " all breathing human passion far above."

§ 49. In these days, mass-production of all kinds, and in great cities. In those days, individual craftsmanship and artistry in secluded places. In these days, the organization of modern medicine for wholesale achievement in all its departments ; team-workers and the rush of the highways, with a certain scorn for the isolated. In those days, a placid and leisurely solitude, in which could be attained a quiet seership of Life.

In thought, we of this day may step aside from the rush of the highways and lanes, and in our wayfaring find ourselves back in those times, meeting with a solitary and forgotten seer, stay quietly awhile with him, and through him gain a glimpse of Something which nothing else can reveal, Whose very truth is abiding and irresistible.

2. THE SUBJECT-MATTER OF MEDICINE

11. To medicine pertains the (study of the) human body—how its health is maintained; how it loses health. To know fully about each of these we must ascertain the causes of both health and sickness.

12. Now as health and sickness and their causes are sometimes evident to the senses and sometimes only perceived by means of the evidence afforded by the various symptoms, we must in medicine gain a knowledge of the symptoms of health and sickness.

It is a dictum of the exact sciences that knowledge of a thing is attained only through a knowledge of the causes and the origins of the causes—assuming there to be causes and origins. Consequently our knowledge (of health and sickness) cannot be complete without an understanding both of symptoms and of the principles of being.

Symptoms: the word includes our modern "signs" and "symptoms." *Principles of being:* this is the topic of scholastic metaphysics. *Only through a knowledge of causes:*—compare the following:—

"It is impossible to know a thing perfectly unless we know its operation; since from the mode and species of its operation we gauge the measure and quality of its power, while the power of a thing shows forth its nature: because a thing has naturally an aptitude for work according as it actually has such and such a nature.

"Now the operation of a thing is twofold, as the Philosopher teaches (9 Metaph., D.8, viii. 9); one that abides in the very worker and is a perfection of the worker himself, such as to sense, to understand, and to will; and another that passes into an outward thing, and is a perfection of the thing made, that results from it, such as to heat, to cut and to build." (*Contra Gent.*[81], ii. 1).

13. There are four kinds of "cause" (of health and sickness):—

1. The *material cause*—namely, the human subject in a state of health or disease. The immediate subject is: the members and the breath. The more remote is: the humours. The most remote is: the (imponderable) "elements." The humours and the elements are composites, and they are liable

to vary. But though they are subject to a variation of composition and change they show a certain constant unity, to which they converge—namely, a unity of "constitution," or of "form." The constitution is in relation to the "change"; whereas the "form" is related to the "composition."

2. The *efficient causes* are such as change or maintain the states of the human body. Namely :—

Extrinsic : the air and affiliated agents :
localities, countries, habitable regions and the like :
comestibles, potables, and the like.

Intrinsic : movement and its opposite—repose of body and mind ;
including sleep and its opposite—the waking state ;
evacuation of secretions and excretions ; and its opposite —retention thereof :
the changes at the different periods of life ·
occupations ; habits and customs :
descent (race, nationality).

Agents affecting the human body by contact, whether contrary to nature or not.

3. The *formal causes :* the constitutions ; the compositions ; the faculties proceeding from the constitutions.

§ 50. Costaeus, the Annotator of the Canon (1608 ed.) passes on to speak of health as a "harmony of the composite, the formal cause of the human body." Galen also defined temperament as the formal cause of the human body. It is exactly here that we find the issue between theology and rationalism, for the former defines the formal cause of the human being to be what is called "the rational soul."

The refutation of the statements is adequately made by S. Thomas[84] (lxiii), thus :—

"Harmony cannot move a body or govern it, as neither can a temperament. A harmony and a temperament also admits of degrees. The notion of harmony rather befits qualities of the body than the soul ; thus health is a harmony of the humours ; strength is a harmony of muscles and bones ; beauty is a harmony of limb and colour. . . . Harmony may mean either the composition itself or the principle of composition. Now the soul is not a composition, because then every part of the soul would have to be the composition of the parts of the body. . . ." (I, p. 166).

Just as the mediæval physicians fell into the rationalistic error so ably and thoroughly exposed throughout the "Contra Gentiles," when they "freed" themselves from stereotyped teaching, so with modern teaching.

The physical and chemical facts which were discovered in the nineteenth century appeared finally to controvert both the statements of the Canon and those of the scholastic metaphysicians ; but it is gradually becoming clear to more and more thinkers that this is not the case.

4. The *final causes:* the actions or functions. A knowledge of these presupposes a knowledge of the faculties and the breaths (which are the subjects of the faculties) as we shall show.

14. These, then, are the subjects which pertain to medicine. Familiarity with them gives one *insight* into how the body is maintained in a state of health, and how it becomes ill. A full understanding of how health is conserved, or ill-health removed, depends on understanding the underlying causes of each of these states and of their "instruments." For example—the regimen in regard to food, drink, choice of climate, regulations regarding labour and repose, the use of medicines, operative interference.

Physicians treat of all these points under three headings, as will be referred to later—health, sickness, and a state intermediate between the two. But we say that the state which they call "intermediate" is not really a mean between the other two.

15. Now that we have enumerated these groups of causes (of health and sickness) we may proceed to discuss whatever Medicine has to say concerning (*a*) the elements; (*b*) the constitutions; (*c*) the fluids of the body; (*d*) the tissues and organs—simple and composite; (*e*) the breaths and their natural, sensitive and vital faculties; (*f*) the functions; (*g*) the states of the body—health, sickness, intermediate conditions; and (*h*) their causes—food, drink, air, water, localities of residence, exercise, repose, age, sex, occupation, customs, race, evacuation, retention. The external accidents to which the body is exposed from without; (*i*) the regimen in regard to food, drink, medicines; exercises directed to preserving health; (*j*) the treatment for each disorder.

16. With regard to some of these things there is nothing a physician can do, yet he should recognize what they are, and what is their essential nature—whether they are really existent or not. For a knowledge of some things, he depends on the doctor of physical science; in the case of other things, knowledge is derived by inference [reasoning]. One must presuppose a knowledge of the accepted principles of the respective sciences of origins, in order to know whatever they are worthy of credence or not [criteriology]; and one makes inferences from the other sciences which are logically antecedent to these. In this manner one passes up step by step until one reaches the very beginnings of all knowledge—namely, pure philosophy; to wit, metaphysics.

Hence, if a doctor undertakes the proofs of the existence of the "elements" and the "constitutions" and their derivatives from medicine itself he errs, for medicine cannot make these things clear, belonging as they do to the domain of natural science.

§ 51. In regard to this last sentence note: "It is not the concern of physical science (incl. medicine: Tr.) to study this first origin of all things; that study belongs to the metaphysician, who deals with being in general and realities apart from motion" (Contra Gent. ii, c. xxxvii).

In reference to the same, note also the following passage by J. Rickaby, S.J., [79] (p. 103): "motions, molar and molecular, vibrations and transferences chemical, biological, mechanical or cosmic—are the subject-matter of the professor of physical science; but the Creator and the creative act are above motion . . . the range of physical science is narrower and lower than that of literature. . . . When a physicist pronounces on a religious question either for or against religion, he is *sutor supra crepidam*: he has overshot his subject. *Of course he ought to overshoot his subject.* . . . Wherever physical science becomes the staple of education, to the setting aside of Latin and Greek, it will be found necessary . . . in the interests of religion to insist upon a parallel course of metaphysics, psychology and ethics . . . trained on physical science without literature and philosophy, the mind suffers atrophy of the religious faculties, a disease which some seem anxious to induce upon mankind—a painful disease nevertheless, productive of much restlessness and irritability."

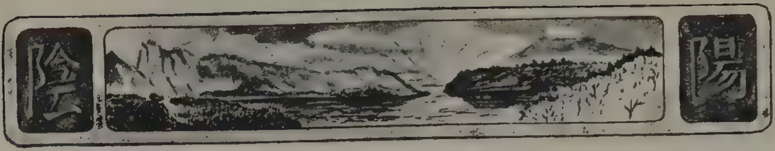
17. List of what the physician aims at having a clear notion of; what each is, and whether the non-manifest actually exist or not.

1. The elements. Do they exist? How many are there? In what modes are they? What are they? How do they arise?
2. The temperaments and constitutions. What are they? How many are there?
3. The fluids of the body. Do they exist? How many are there?
4. The members and the sense-organs. [The science of anatomy.]
5. The faculties. Do they exist? How many are there?
6. The functions. [The science of physiology.]
7. The breaths. Do they exist? How many are there? Where are they? What changes in state do they undergo? What are the causes of retardation (lagging) of the breath?

(Or : the changes in the affective faculties ; and the cause of their persistence.)

8. The causes. How many are there ?

18. The physician must also know how to arrive at conclusions concerning (1) the causes of illnesses and the individual signs thereof ; (2) the method (most likely to) remove the disorder and so restore health. Wherever they are obscure, he must be able to assign to them their duration, and recognize their phases.



THESIS II. THE ELEMENTS

ELEMENTS. **19.** The elements are simple bodies. They are the primary components of the human being throughout all its parts, as well as of all other bodies in their varied and diverse forms. The various orders of beings depend for their existence on the intermixture of the elements.

Elements: Equiv.: cosmic elements; imponderable elements; primordial essences; first-principles; elementary principles; grades of radiance.

It is important to note that these elements are *not* " matter," but have only a virtual existence, as explained more fully below (§ 73; **309**).

" Formae elementorum sunt in mixto virtute, non actum motu.[83] (76. 4. 4. m.)

> " I am in water, and earth, and fire, and air.
> These four around me, yet of these four I am not."
> (Shamsi Tabriz,[88] T. 235, 5, p. 220.)

A difference must therefore be observed between them and the literal earth, water, air and fire.

Each of the latter, it must be noted, contains all four elements, imponderable elements, the correspondingly named element being merely preponderant (cf. § 143).

Simple bodies.—That is, simple in the scholastic sense; indivisible. " Simplicity is that quality in virtue of which a substance has neither constitutive nor quantitative parts " (Mercier,[56] ii. 523).

20. Natural philosophy speaks of four elements and no more. The physician must accept this. Two are light, and two are heavy. The lighter elements are Fire and Air; the heavier are Earth and Water.

Four elements and no more.—In Chinese, Buddhist, and Ayurveda philosophy there are five. In theosophy also, a fifth, named " ether," is given. The alchemists gave three. Aristotle discussed a fifth saying " the heaven is not of the nature of the four elements, but is itself a fifth body, existing over and above these "—quoted by S. Thomas [84] (68. i. p. 218). These various statements are not actually mutually contradictory (cf. § 29).

Light: equivalents: weak, male (because conferring or inceptive), positive, active. Heaven.

Heavy: equivalents: strong, female (because recipient), negative, passive. Earth.

> "Heaven is man, and earth woman in character;
> Whatever heaven sends it, earth cherishes.
> When earth lacks heat, heaven sends heat;
> When it lacks moisture and dew, heaven sends them."
> (Mesnavi,[57] p. 161.)

21. The Earth. The Earth is an "element" normally situated at the centre of all existence (see scheme in § 54). In its nature it is at rest, and all others naturally tend towards it, at however great a distance away they might be. This is because of its intrinsic weight. It is cold and dry in nature, and it appears so to our senses as long as it is not interfered with by extraneous agencies, and obeys its own peculiar nature. It is by means of the earthy element that the parts of our body are fixed and held together into a compacted form; by its means the outward form is maintained.

> "The Earth is the warp and weft of thy body."—(Mesnavi,[57] p. 41.)

"Earth" is understood in respect of its principal property of dryness[84] (69, i. p. 234).

22. The Water. The Water is a simple substance whose position in nature is exterior to the (sphere of the) Earth, and interior to (that of) the Air. This position is owing to its relative density. In nature it is cold and moist. It appears so to our senses as long as there are no influences to counteract it. Its purpose in (the world of) creation lies in the fact that it lends itself readily to dispersion, and consequently assumes any shape without permanency. In the construction of things, then, it provides the possibility of their being moulded and spread out and attempered. Being moist, shapes can be readily fashioned (with it) and as easily lost (and resolved). Dryness, on the other hand, permits forms to be assumed only with difficulty, and they are resolved with similar difficulty. When dryness and moisture alternate, the former is overruled by the latter, and thus the object is easily susceptible of being moulded into a form; whereas if the moisture were overruled by dryness, the form and features of the body would become firm and constant. Moisture serves to protect dryness from friability; dryness prevents moisture from dispersing.

"Verily the likeness of this present life is no other than as *water* which we send down from heaven, and wherewith the produce of the earth is mixed, of which men eat, and cattle also, until the earth hath received its vesture and is adorned. The inhabitants thereof imagine that they had power over the same, but our command cometh unto it by night or by day, and we render it mown (as reaped seed-produce: Woking trans.), as though yesterday it had not abounded with fruits." Quran, x. 24. (p. 51, Gulshan[25].)

Again, more specific still, Quran 18. 45. shows that Water enters into the plants, and *only as long as it is there do they live.* "The parable of the life of this world: like *water* which We send down from the cloud so the herbage of the earth becomes luxuriant on account of it": (Woking trans.) "min assama fa khatalatabihi . . ." mingled with—or, as one may paraphrase (cf. the sevenfold interpretation of the Quran): "water is the channel of life"; and note that the water came from the cloud, to which it was itself drawn by the solar heat!

"Water has especially a life-giving power, since many animals originated in water, and the seed of all animals is liquid. Also the life of the soul is given by the water of baptism"[84] (ib. 74, iii, p. 273). "Augustine holds 'water' to mean 'formless matter.'"

Water may be understood here in the sense of "radical moisture" (Paracelsus), which is absolutely essential to life, "H_2O" being thus as it were an instrument or substrate. The plant cannot shoot out leaves, flowers and fruit without it; so man cannot thrive without this radical moisture, or innate moisture. Moreover, on this view, the moisture is conserved by a medium which has "material" humidity—a concept which brings us to the domain of chemistry.

The watery nature may be called "fluid nature"; pliability; living character.[39]

So, in the Chinese conception, Forke[23] (p. 271) explains, that the "fluid" of water is yang, and its substance yin; the fluid of earth is yang, and its "substance" yin; whereas the "fluid" of fire is Yin, and its "substance" Yang. Yin is here understood in a procreative sense, Yang in a destructive sense.

23. THE AIR. Air is a simple substance, whose position in nature is above the sphere of Water, and beneath that of Fire. This is due to its relative lightness. In nature it is hot and moist, according to the rule which we have given. Its effect, and value, in (the world of) creation is to rarefy, and render things finer, lighter, more delicate, softer, and consequently better able to move to the higher spheres.

See also under "atmospheric air" (**264**).

The air-"element," entering into the "breath," is that which enables us to stretch and contract, and also makes possible the involuntary movements throughout the body.[38]

24. THE (SPHERE OF THE) FIRE.

"Ignis est causa omnium ignitorum."—(St. T.,[81] iii. 46.)

Fire is a simple substance, which occupies a position in nature higher than that of the other three elements—namely the hollow of the sublunary world, for it reaches to the (world of the) heavens. All things return to it. This is because of its absolute lightness. In nature it is hot and dry. The part which it plays in the construction of things is that it matures, rarefies, refines, and intermingles with all things. Its penetrative power enables it to traverse the substance of the air; by this power it also subdues the sheer coldness of the two heavy cold elements; by this power it brings the elementary properties into harmony.

The difference between the "element" fire, and fire as usually understood is shown in describing flame, for instance, as "material" fire, and vesicants like cantharides, urtica, as "essential" fire. Or, as stated under "air," there is a "fluid" of fire and a "substance" of fire. Just as "water" is "radical" or "substantial," "material."

25. The two heavy elements enter more into the construction of the members (and fluids of the body, Costaeus), and contribute to repose. The two light elements enter more into the formation of the breaths and contribute to their movement as well as to the movement of the members—always remembering that it is the form that is the motor (and not the breath. The form initiates the breaths and through them moves the organs of the body and the limbs.) So much for the elements.

"Elementa subtiliora predominantur in mixto, secundum virtuté; sed grossiora secundum quantitatem."—(Sum. Theol.,[83] 71, 1, 2m; 91, 1, c. 3m.)

Fire, Air, Aether; the nourishing flame which imparts heat, life, sense and intelligence[17] (xiv. 153).

§ 52. "It is the form that is the motor and not the breath."—In this sentence is contained the crux of the whole subject. "Form," used in the scholastic sense, has a subtly specific meaning when applied to the human being. This meaning is gone into in the accompanying exposition. Briefly, the form when associated with the solid, fluid, and gaseous components (earth, water, air) of the "body" is called a "living human being," and it accounts for the continual movement of the "breaths" (life-principle) which manifests to the onlooker that that human being really is living.

§ 53. Position in nature.—If the names of the elements are taken as synonymous with the corresponding words describing mundane nature, it is evident that earth (land) *is* higher than "water"; and that "air" is above both. The fire (solar heat) is above all. But mystically speaking there is such a relation apart from the geographical one.

§ 54. In the following scheme the classification of "worlds" is set out according to the various schools of thought (Koranic, Persian, Ptolemaic, etc.) prevailing in the middle ages. The literal discrepancies are simply due to the standpoint having been taken differently—sometimes theological, sometimes philosophical, sometimes scientific—by the several schools of thought.

SCHEME OF THE POSITION OF THE SEVERAL "WORLDS" AS CONCEIVED BY THE ANCIENTS.

The Vacuum. Al-Khala ; la Khala wa la Mala. "Neither vacuum nor plenum" (E. G. Browne,[6] 118).

Eleventh Heaven. The Empyrean. The seventh heaven of S. Thomas,[84], "wholly luminous" (68, p. 228).

Tenth Heaven. The Primum mobile (because it originates the motions of the lower "spheres." The Plain. The starless Heaven. Al Falaku'l-Atlas. Ptolemy's Empyrean.

(* Ch. Maq,[7] p. 4, makes this the ninth heaven.)

Ninth Heaven. The Crystalline. The sixth heaven of S. Thomas, or "Aqueous"; "wholly transparent." The Celestial sphere. The Highest Heaven. 'Arsh[25] (p. 22). The movements in this accounts for the irregularities of movement in the fixed stars.

Eighth Heaven. The Zodiacal Sphere. The Throne, al-'Arsh (Quran). The fixed stars. The zodiacal heaven is the confine of the material universe. The fifth Heaven of S. Thomas: the starry heaven with eight spheres, the first being that of the fixed stars.

Seventh Heaven to First Heaven: "The sphere of the Planets."

"Into seven heavens did He fashion it"[25] (W., p. 22).

"He made them complete seven heavens" (Q., 2, 29). "Every *sama* (Heaven) is a heaven in relation to what is beneath it, and earth in relation to what is above it." Raghib. quoted in Woking trans. of Quran.

"There are seven corporeal heavens in all, in the opinion of Rabanus"[84] (68, 4, p. 228). Here comes the Angelic Kingdom (good and bad angels).

Seventh. Saturn: Black. The first to be created.
Sixth. Jupiter: Blue. Presided over by Michael. Formed from the light of himma (meditation).
Fifth. Mars: Blood-red. Presided over by Azrael. Formed from the light of Wahm (judgment).
Fourth. The Sun. Presided over by Israfil. Formed from the light of Qalb (heart).
Third. Venus. Yellow. The world of similitudes. Formed from Khayal (phantasy).
Second. Mercury. Grey. Formed from Fikr (reflection).
First. Moon. White, then silver. Made from Aether.
"*The heaven of the moon.*" Jili[63] (p. 122)

(Here comes "the horizon between matter and spirit."[81])

Sublunary world :[81] The "world of growth and decay."[7]

Fourth Interspace (Furja[7]). The Human Kingdom.

Fourth Elemental Sphere. Igneous sphere. *Fire.*

Divided by Rabanus into an upper region, the fiery heaven, and a lower, the Olympian heaven.

Third Interspace. The Animal Kingdom.

Third Elemental Sphere. Aerial sphere. *Air.*

Divided by Rabanus into an upper region, the ethereal heaven, and a lower, the aerial heaven.

Second Interspace. The Vegetable Kingdom.

Second Elemental Sphere. Aqueous sphere. *Water.*

First Interspace. The Inorganic World (chiefly E. and W.; aided by A. and F.).

First Elemental Sphere. Terrestrial sphere. *Earth.*

Jili refers to seven limbos of the earth[63] (p. 124).

EXPLANATORY EXTENSION OF THESIS II

1. Preliminary remarks.
2. The doctrine of matter and form: (*a*) Considered statically; (*b*) Considered dynamically.
3. The doctrine of imponderable elements: (*a*) Considered statically; (*b*) Considered dynamically.
4. Application of the doctrine to biochemistry, histology, etiology, etc.

1. PRELIMINARY REMARKS

§ 55. Thesis II is the foundation of the whole Canon, but so entirely has the doctrine and world-conception of Avicenna been superseded by modern scientific teaching that the whole of his work may be said to fall with it.

The fact that for millions of intelligent people this world-conception (scheme of things, theory of life, Weltanschuung) is an intense reality in their daily lives (Forke,[34] p. 239) does not usually signify, and yet even a training in Western universities does not dispose them to abandon it.

So too, the daily-recited Breviary still contains the *Benedicite opera omnia*, in which the four "elements" sing their praise, just as for S. Francis, in his *Song of the Sun* they were an instruction for us to do likewise.

Their immediate dependence for existence upon the continuously exercised will of the Creator is spoken for both by S. Thomas Aquinas, in the West, and by the Persian Sage in the East. "Even air, water, earth, and fire draw their sustenance from Him, both winter and summer" (Mesnavi). As the mighty servants of God ("to us they seem lifeless, but to God living," Mesnavi,[57] p. 15) they offer Him praise (Quran) and service (Mesnavi).

The modern world-conception sets out that the universe is composed of chemical elements grouped into compounds, aggregated into masses varying from the size of vast nebulæ to the smaller but still vast "suns," down to the fragments of dust beneath our feet; whereas the modern scholastic philosophy sees in our space-time world only a fringe (Cf. Job xxvi. 14), and allows that the ancient idea of "heaven beyond the blue" evidenced understanding and not superstition. In short, the doctrine underlying Avicenna is capable of justification.

2. The Doctrine of "Matter" and "Form"

A. Considered Statically

§ 56. Inanimate matter, in a state of rest, is the outcome of two principles, neither of which exists apart from the other. These are: the principle of inertia, or passivity; the principle of activity. The former receives the scholastic term "primary matter"; conveniently abridged to *m*. It is the "material cause" of a thing. The second principle is termed "form," "formal cause"; conveniently abridged to *f*. It is non-material.

> "Man is the result of the combined operation of heaven and earth, of the union of two principles" (Li Ki[47], vii. 3. 1).

Every object has its *f*, but every *f* is not corporeal, for while some *f*'s are intrinsically dependent on matter, others can exist apart from matter.

§ 57. *m* remains indifferent and undetermined; it will take an infinite number of active principles *f*. But as soon as a given *m* has taken a given *f*, it ceases to be indifferent, for it has become *mf*. The union of *m* and *f* results in a concrete object—"matter," as ordinarily understood. In other words, it is said that when *m* receives *f*, a physical or corporeal substance (object) appears. *f* is said to "in-form" *m*; when that has happened, we have *mf*, "substantial form," the physical substance, "in-formed matter." So *f* is called the "formal cause" of a thing. *f* is also called a "determining principle." It "perfects" or completes *m*. So, we say, "when *m* is completed by *f*, a physical substance appears." *f* is also called "essential form." Correspondingly, it is said to give rise to *mf*, the "essence."

f imparts distinctive nature to *m* and fixes the character and properties and activities resulting from the union. *f* provides the "deep intrinsic reason" for *mf*.

$mf, mf', mf'', mf''' \ldots mf^n$ would represent as many different objects, whether living or non-living.

§ 58. *mf*, then, stands for the following concepts: (1) physical substance, corporeal substance. "Corporeal" because evident to our senses. "Substance" because viewed in its "static" state—inactive, stationary. Every chemical substance is a different *mf*. (2) "nature." Here it is viewed in reference to its powers of activity. (3) "essence": here we describe what it is, and say what distinguishes one *mf* from another, from all other *mf*'s. In other words, it has "transcendental properties"—being, essence, unity, distinction from other beings, truth, and good. Every object is a being. Every object is a "creature." Every object perceptible by our senses is a material being. (4) "Constitution." Here we study *mf* from the point of view of how it came into being.

§ 59. Every object has three causes for its existence: material, formal, and efficient. That which brings about the union of *m* (material cause) and *f* (formal cause) is called the "efficient cause." There is another cause called the "final cause"—namely the *reason* for its existence, the reason for its creation.

§ 60. As soon as mf exists, certain qualities become manifest to our senses, by which we are enabled to form a mental image of the object—over and above the "transcendental properties" just referred to. These qualities are called "accidents." In the formula, we represent them by the italic a. A concrete object is therefore represented more accurately by the symbol $mf.a$, the dot showing that mf forms one essence. To be more exact, then, the different objects around us would be represented by the formulæ $mf.a$, $mf.{}'a'$, $mf.{}''a''$, $mf.{}'''a'''$ . . . $mf.{}^{n}a^{n}$.

§ 61. A further scholastic term is introduced if we say that "when mf ('potentiality') becomes 'actuality,' it is mfa."—This is another way of saying that until a substance actually exists, it has no "accidents," or "qualities."

§ 62. The same symbol—$mf.a$—stands equally for a chemical atom, a chemical compound—inorganic or organic—however complex; for a whole mineral; for a histological "cell" (microbe, protozoan, cell-colony, simple or complex), for a whole plant or animal, or for a human being as a whole. Any object in the universe—water, stone, tree, mountain, herb, sun—can be represented by this same symbol. Every object is a "creature" in the Thomistic sense. Every object is "in-formed" matter. The differences between them all depend on the f.

§ 63. "Human nature" is "informed matter," bearing certain properties or marks, and endowed with "existence." Each organ in the body is "informed matter." Every tissue is "in-formed matter." The blood, the lymph, the urine, etc., are each of them "in-formed matter." Every microscopic cell of which the tissues are composed is merely "in-formed matter." So also is every chemical entity which composes the cells, and the whole person also is just "informed matter."

§ 64. In the case of a living human being there is this complication that each particle of matter of which he is composed is represented by $mf.a$, and the body itself, as a whole, is representable by $mf.a$. To picture the whole person more satisfactorily we should employ a capital letter—say M—to stand for the actual matter of the body; and the human "form" would be representable by another capital letter F, for the human "form" differs from all other forms. Hence the human being is symbolized by MF, rather than by $mf.f'$ or $mf+f'$—both of which would be inaccurate. $M=n.mf.a$. When death occurs, MF becomes M and F; M becomes $n.mfa$ again—simply a collection of chemical inanimate substances. MF stands for "a human soul." F is not "soul." F does not exist without M in the first instance, but after death it does exist without M. However, the great and important fact is that at the time of death F is no more like F at birth; being different, it is correct to symbolize it as F'.

The object of life is not to alter one's character, but to *control* it so that the passions never come to light. It is not for us to try and "add a cubit to our stature" (Mt. 6, 27) but to direct our unchangeable "character" into the very highest altruistic direction. The object of life is to prevent the character from determining the form of one's actions. See §164 iv.

Many of the laws operating in the non-living substance *mf.a* also occur in *MF*, though every separate *MF* follows its own laws. The laws peculiar to the chemical substances of which the body is composed necessarily apply in *MF*, as well as those pertaining to his being a particular *MF*. The mere fact of *MF* being altogether more elaborate than its component *n.mf.a*'s (which together make *M*) does not abrogate the applications belonging to those component *mf*'s—a fact which is often overlooked. Rationalism, for instance, assumes that because the lower are still present, the higher must simply be a variety of them.

" In the living conscious being, this qualitative determining factor (the germinal principle) takes a still higher form, its range of activity is wider, its power of applying, directing, and disposing of the energy stored in the organism is more varied and more flexible, but it cannot alter the quantity of the capital funded in the self-moving machine. If, then, it be the quality of the forces distributed in the nervous system which the directive power of the soul immediately determines, the liberation and control of a man's physical activity by his thoughts and volitions need not necessarily conflict with even the most rigid fulfilment of the law of the constancy of the quantity of energy." (From P. Couailhac, La Liberte et la conservation de l'Energie, Paris, 1897, Livre iv.; quoted by Maher[5], p. 523).

" If an angel or a demon set a barrel rolling down a hill by even a slight push, the action of such a spirit would involve the invasion of the system of the material universe by a foreign energy. But this is not the way the soul acts, according to the philosophy of S. Thomas and Aristotle. Here the soul is part of the living being, a component principle capable of liberating and guiding the transformation of energies (it selects and stores up) in the constitution of the material organism, which along with its compounds goes to form a single complete individual being." (Maher[50], p. 428).

Again, not in virtue of its rationality is the forma animale, but through the vegetative and sentient faculties. (Aristotle, quoted in [17], ix. 239).

§ 65. There is an important passage on " matter " in the Summa Theol.[64] (Q. 85, Art. 1, p. 185-6) which brings out the distinction between the ponderable and the imponderable: the interested reader should really study the whole section of the Summa, on the " Understanding."—" Matter is twofold, common and *signate* or individual; common, such as flesh and bone; and individual as this flesh and these bones. The intellect therefore abstracts the species of a natural thing from the individual sensible matter, but not from the common sensible matter. . . . Mathematical species, however, can be abstracted by the intellect from sensible matter, not only from individual, but also from common matter; not from common intelligible matter, but only from individual matter. For sensible matter is corporeal matter as subject to sensible qualities, such as being cold or hot, hard or soft, and the like; while intelligible matter is substance as subject to quantity. Now it is manifest that quantity is in substance before other sensible qualities are. Hence quantities, such as number, dimension and figures, which are the terminations of quantity, can be considered apart from sensible qualities; and this is to abstract them from sensible matter. . . . But some things can be abstracted even from common intelligible matter, such as *being*, *unity*, *power*, *act*, and the like; all these can exist without matter, as is plain regarding immaterial things."

B. Considered Dynamically. Change

" The kettle is silent, though it is boiling all the while." (Mesnavi[57], p. 261.)

§ 66. It is natural to consider the objects of the material world as being in the first place stationary; that is, in a state of static being. But actually they all undergo change, from the highest to the lowest. There is movement either in the object itself, or at the instance of some other object. Hence we now consider the dynamic changes in *mf.a.*, *MF*.

§ 67. Changes are of two kinds—" substantial change," " accidental change." The example of the former is the chemical change occurring in the course of chemical reactions. $mf.a$ becomes $mf.'a'$. The example of accidental change is, for instance, when water becomes steam ; when a person or plant grows ; when a person becomes emaciated, or an object shrinks in size.

§ 68. The nature of substantial change is most important in regard to physiology and pathology. The first step is associated with a disappearance of the old f, the process called " corruption " by the scholastics ; in modern words, " disintegration." There is then a new f'—the new " form," whose appearance is called " generation."*

§ 69. From the point of view of the *causes* at work, there are three steps—an external agent or material cause, a receptive function, whereby the old m receives a new f', and the efficient cause which brings f' into union with m.

§ 70. In the view of modern science, of course, the properties of " water " for instance, appear at the moment when the H_2 and O meet and unite ; the appearance of NaCl and H_2O, again, is adequately explained simply from the union of NaOH and HCl in appropriate proportions. But Thomistic science perceives the need of something further. The water-molecule, or complex of molecules, is something more than the two H atoms linked to oxygen, and this something is the inert principle of matter m, which releases the old f and accepts the new f^1. As Rahilly explains, a molecule or a complex of molecules such as an organism, presents not only " colligative or summational properties, but also indiscerptible specific qualities of the whole which cannot be distinctively predicated of or portioned out among the parts." " We must therefore conceive—not imagine !—a spatially complex and disparate aggregate as being in some fundamental sense, one " being."†

§ 71. The causes of substantial change (the efficient causes) in inanimate " beings " are the well-known familiar extrinsic " forces of nature " ; but in the case of living beings, the efficient causes are the intrinsic " faculties " which they possess. Some of the latter account for changes of substance, while others have to do with a change of position—locomotion ; and others again excite a movement in the mind.

§ 72. In the human being, the immediate efficient cause of an outwardly visible act consists of the muscles and nerves ; behind that is the more remote efficient cause—the sensuous appetition or desire ; and behind that is the sensuous cognition, which is an integral property of MF—a passive act, itself a " faculty." Behind that, peculiar to the human being, is the all-important final cause. This is philosophically described as " the means by which perfection of life is reached "—whether that " perfection " be relative or absolute, whether the interests of the physical body are served, or the intellectual life, or whether the highest perfection (i.e. of soul) is the goal in view—where MF uses M as the " innocent creature of God," in order to attain true perfection.

*" God is an Abaser and an Exalter. Without these two processes nothing comes into being." Mesnavi[87], p. 300.

†Rahilly, appendix to " Modern Scholastic Philosophy "[56]

In animalibus quae movent seipsa est magis quaedam colligatio partium quam perfecta continuatio (St Thomas, *In VIII. Physic.* I. 7).

3. The Doctrine of Imponderable Elements

A. Considered statically

§ 73. (1) *Relation of the imponderable elements to " matter" and " form."*—Do the elements belong to " primary matter " or to " form " ?

This problem was discussed in so masterly a fashion by St. Thomas that his words are still applicable and unsurpassable. His perfect understanding of the nature of matter is combined with a precision of explanation which should satisfy every student. The following quotations may be made : " By the words earth and water (in Gen. i.)primary matter itself is signified " and not literal water or earth (Augustine[84], p. 194, S. T. 66, 1). " The ancient material philosophers maintained that primary matter was some corporeal thing in act, as fire, air, water, or some intermediate substance " (ib. p. 192) " Corporeal matter was impressed with the substantial form of water, and with the substantial form of earth " (p. 231) " The power possessed by water or earth of producing all animals resides not in the earth and water themselves, but in the power originally given to the elements of producing them from elemental matter " (ib. 71, i, p. 251).

In the note to **19** it is seen that the four elements cannot be assigned to literal matter. But they cannot be assigned to " form " either, as they have no being until literal matter has itself come into being. Hence, while the chemical elements are *mf*, the imponderable elements are neither *m* nor *f*, for they are inseparable from *mf*, and the primary qualities of a thing do not appear until it exists—that is, till *m* and *f* have become *mf*.—" The two exist because of the one, but hold not even to this one " (Seng-ts'an, in Susuki[91], p. 184)—words used in another connection, but equally applicable.

§ 74. " Humidity " says Paracelsus [83] (ii. 264) is not " an element of water, or burning an element of fire. An element is not to be defined according to body, substance, or quality. What is visible to the eyes is only the subject or receptacle." . . . " Fire which burns is not the element of fire as we see it . . . the element of fire can be present in green wood no less than in fire. . . . Whatever grows is of the element of fire, but in another shape. Whatever is fixed is of the element of earth. Whatever nourishes is from the element of air, and whatever consumes is from the element of water. Growth belongs to the element of fire " (Cf. "innate heat" § 140) " Where that element fails, there is no increment. Except the element of earth supplied it there would be no end to growth. This fixes it; that is to say, it supplies a terminus for the element of fire. So, also, unless the element of air were to act, no nutrition could be brought about " (Cf. oxygen) " By the air alone all things are nourished. Again, nothing can be dissolved or consumed unless the element of water be the cause. By it all things are mortified, and reduced to nothing " (ib. 266). " The invisible elements need to be sustained, nourished and increased by some visible thing, and at length they perish with them." In other words, the " elements " only exist as long as there is *mf*. " Both are interdependent and related, though their activity goes on without waste or loss." . . . " Each invisible attracts to itself its own. Stones come forth from the strong spirit of the earth " (ib. ii. 279).

Such passages, often supposed to be meaningless, become intelligible in the light of Thomistic philosophy, though according to biographers, Paracelsus would not have wished to appear to subscribe to that.

§ 75. The imponderable elements must not, however, be confused with " accidents " (*a*). " Primae quatuor qualitates non sunt habitus elementorum " (S. T.[83], 49, 4, 1). These primary qualities form the link between the object and our own consciousness, for our knowledge of the universe is really simply a knowledge of those qualities (heat, cold, moist, dry) with that of secondary qualities (subtility, thickness, lightness, heaviness, rarity, density, translucence, opacity, brilliance, dullness, etc.). " Sensible matter is corporeal matter as subject to sensible qualities, such as being cold or hot, hard or soft, and the like " (ib. [84], 85, i, p. 186).

§ 76. So all the concrete objects of this world—from the granite mountain to the microscopic protozoon—are related to one another in virtue of the imponderables. And in virtue of the same, they are related to extra-mundane objects (sun, moon, stars). " The matter of the heavenly bodies and of the elements agree in the character of potentiality " (ib. [84], 66, 2, p. 199). Since matter cannot exist without them, the human body itself must also manifest them.

§ 77. (2) *The analogy between the four elements and vibration-rate.* The earth element may be compared with a slow vibration-rate, the water element with a more rapid rate, and the remaining elements with still quicker vibration rates. The slower rates are " coarser," and the more rapid ones are " finer." Hence, as Avicenna says, the earth and water are " heavy " and the others are " light." The meaning of the imponderable elements is made more intelligible through the idiom of modern science. But in making such an analogy we must avoid the common error of equating things capable of being analogized with the same thing. To compare the " elements " with vibration-rate, is to compare them with light. " Soul," " radiance," " spirit," " breath " have all been compared with light (" lux "). But to pass on to indentify them in any sense with " lux perpetua," and then with " Universal Intellect " is indefensible, yet even modern thought is not immune from the fallacy. Paracelsus[72] explains " element " as " spirit " (meaning " form," no doubt), which " lives and flourishes " in the visible objects of Nature " as the soul in the body " . . . " not indeed," he explains, " that it is of precisely the same essence as a soul, but it corresponds with a certain degree of resemblance. There is a difference between the elemental and the eternal soul. . . . For the first matter of the elements is nothing else than life, which all created creatures possess. The soul of the elements is the life of all created things " (ii. 264). Averrhoes said " of all things the soul is most like light."

The perfect reasoning in dealing with these errors, which is given by S. Thomas in " Contra Gentiles " should be studied by all who are inclined to award the last word to scientific theories.

§ 78. (3) *Applications of the doctrine.*—The application of the doctrine to the subject-matter of Medicine is simple when the elements are represented by their corresponding " tendencies." A few of the relations are shown in tabular form, by way of illustration. Thus :—

Name of Element.	Tendency.	Corresponding system.	Excretion.	Special Sense.	Operation in body.	Type of mind.	Corresponding mental state.
Earth	Spreading	Skeletal	Faeces	Touch	Gives shape	Mental torpor	Obstinacy. Fear.
Water	Drooping Downward	Muscular	Urine	Taste	Nutrition	Lymphatic	Submissive Affectionate.
Fire	Rising	Liver. Blood.	Sweat	Smell	Digestion Physical movements	Optimistic	Anger ; irate Vexation (and weeping)
Air	To and fro	Vascular Cutaneous	Saliva	Hearing	Respiration	Cheerful	Humour
Aether	Stillness	Nervous. The hair	Semen	Vision	Reasoning	Reflective	Sadness

§ 79. The correspondence between body and mind, in virtue of the pervasion of the whole being by the " elements," is specially elaborated, in a particularly interesting manner, by Chu Hsi[11] (p. 214), where the five elements are taken as the " physical " counterparts of " five ethical principles " (love, righteousness, reverence, wisdom, sincerity), which are present in all beings, just as are the elements.

§ 80. The Buddhist exposition of the human being as composed of five elements—" matter," " sensation," " thought," " action," and " consciousness " (e.g. in Honen[32], p. 314)—though raising another question—shows how generally the establishing of an intimacy of relation between body and mind is sought after, in all periods of history.

§ 81. Through the doctrine of the elements, the existence of a subtle indispensable link between tissues, organs, fluids, and mental attributes becomes intelligible. The methods of reasoning peculiar to different peoples and individuals, their changes of mood, their personal behaviours are all to be worked out on this basis, as, in his succeeding chapters, Avicenna works out the nature of temperament, humours, and constitution.

" The 'ether' in the constitution of the creature differs in the degree of its clearness and translucence. When the ether with which the individual is endowed is clear and translucent . . . but neither pure nor complete, some entanglement with creaturely desire is unavoidable ; but it can be overcome and got rid of, and then we have the wise man. When the ether with which the individual is endowed is blurred and turbid, there is the beclouding with creaturely desire to such an extent that it cannot be shaken off, and we have the foolish and degenerate" (Chu Hsi[10], i. 117).

§ 82. (4) *Associated factors.* Since the primary qualities belong to the elements, the laws of action and "passion" apply. Various aspects of this law are described by the terms: strength—weakness; jelal-jemal (Persian); qaḍā-qadr (Arabic). These determine the phenomena of human life, and therefore call for consideration under the dynamic aspects of the doctrine. Statically they are significant to the physician because they reveal themselves in variations of functional capacity of organs. With the dominance of the several elements we may expect corresponding vigour of the several systems of the body—e.g. the nutritive faculty, and the liver-function; renal functions, etc. The emotional make-up, character, and even talents for art, crafts, literature, politics, etc., attitude towards life in general—all these are "coloured" by the dominant "element." The study of the patient's features, gestures, voice, posture, hands acquires an added meaning, as informing about the strength or weakness of the several systems and faculties—to a degree which is not so very inferior to the information afforded by the expensive instruments of modern clinical research.

See also under "destiny." (§§ 111-115)

"Strength is the manifestation of the positive ether, and weakness of the negative. Each of these again is either positive, and then 'good,' or negative, and then 'evil.' Strength when good is righteous, straightforward, resolute, majestic, firm; when evil, harsh, proud, soft, irresolute, and false. The Mean (the ideal) is the maintenance of these principles in equilibrium." Bruce[10], p. 111.

B. *Considered Dynamically.*

"The five elements move unceasingly, succeeding one another in predominance, in turn, though all always exist simultaneously" (Li Ki[47], vii, 2, 3).

"The earthy sign (of the Zodiac) succours the terrestrial earth,
The water sign (Aquarius) sends moisture to it.
The windy sign sends the clouds to it,
To draw off unwholesome exhalations.
The fiery sign (Leo) sends forth the heat of the sun,
Like a dish heated red-hot in front and behind.
The heaven is busily toiling through the ages,
Just as men labour to provide food for women.
And the earth does the woman's work, and toils
In bearing offspring and suckling them."

Mesnavi[57]

§ 83. The movement of the elements is mutually opposite (Sum. Theol.[84] 66; p. 197). Change is continually taking place within the human being. This change is either cyclical or progressive. The former characterizes the ordinary phenomena of physiology, and the latter manifest as "growth." The cyclical changes of physiology (in its biochemical aspect) may be described in terms both of the chemical elements and of the imponderable elements. To do so by the pictorial title of "the *dance of the* *elements*" is at once to bring up the atmosphere of the East, and the very scenery of Avicenna's mind.

> "All the four elements are seething in this caldron (the world),
> None is at rest, neither earth nor fire nor water nor air.
> Now earth takes the form of grass, on account of desire,
> Now water becomes air, for the sake of this affinity.
> By way of unity, water becomes fire;
> Fire also becomes air in this expanse, by reason of love.
> The elements wander from place to place like a pawn,
> For the sake of the king's love, not, like you, for pastime."
>
> Shamsi Tabriz[62] (p. 338).

The changes are the important things;—not the things in themselves, for matter, after all, only exists in virtue of the ceaselessly acting creative power of God. Did He withhold the power, at that instant the matter would cease; it has no reality apart from His intention. It would not be a case of the world being "destroyed," but one of "ceasing to be." We are apt to be deceived by "matter," and devote our thoughts to this instead of to the changes; and perhaps the "moment of nascence" (§ 91) is even more important than the changes themselves. The greatness of the ancient "Book of Changes" (Yi King) is due to the recognition of this principle.

§ 84. The advantage of this simile is that it brings out not only movement of a certain orderly kind, but also rhythm and *motif*; the thought being of such primitive native dances in which the action requires only two dancers (male and female, of course) who are in the presence of many spectators. Each dancer performs entirely different movements, and the *two never come into actual contact.* The movements are harmonized by the music, which is itself as characteristic and essential as either of the performers.

Further, it will be clear that the feelings of the dancers themselves do not concern the watchers; behind their emotions there is the real meaning of the dance, and whether the dancers discern that or not, the observer should strive to discern it. There may be special affinities or attractions between the dancers of the minuet; but neither their pleasure, their displeasure, their steps, nor the music, are the basic reality.

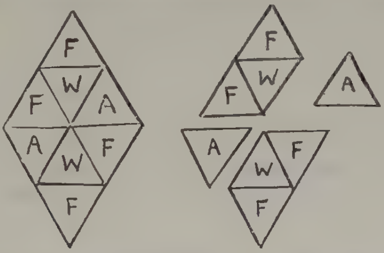
Moreover, the skill of the dancers is not always of the same degree. Artistic genius may produce greater pleasure in the watchers, but there is something greater even than skill.

§ 85. The phenomena of physiology and pathology may be viewed as a series of changes of analogous character, the cycle of changes in chemical elements, tissue-cells, and other rhythmic phenomena being studied without neglecting the conception of the imponderable elements.

§ 86. From the doctrine of matter and form it is clear that with the changes from one chemical compound to another in the course of the cyclical phenomena, there is a dropping of the "form." Also, the imponderable elements rearrange, and blend into new modes at the same time. As the author of Gulshan-i-Raz[36] (lines 250-255 and footnote) says:

> "The elements, water, air, fire and earth,
> Have taken their station below the heavens ;
> Each serving diligently in its own appointed place,
> Before or behind which it never sets its foot.
> Though all four are contrary in their nature and position,
> Still one may see them ever united together.
> Inimical are they to each other in essence and form,
> Yet united into single bodies by fiat of necessity.
> From them is born the three-fold kingdom of Nature."

§ 87. To present a simple example, for illustration—Glucose, for instance, would be described as WA^2F^4, each letter representing the corresponding imponderable element. When this substance is broken up into alcohol and CO_2, by the dispersal of the " cohesive force between the three elements (e.g., by the influence of an " opposite " : the yeast-ferment), two portions of WF^2 result, the " air " having escaped, and the " fire-water " of the aborigines being left behind. This may be represented pictorially thus :



The germination of seeds may be described in similar terms. Thus, it would be said that the ethereal undulations from the sun penetrate the loosened earth round the seeds, and by their successive shocks affect the particles of matter composing the germinal centre of the seed. The readjustments of atoms and compounds with oxygen result in the generation of vital energy. The " earth " (mineral substances, and remnants of animal and vegetable matter) mingled with " water " (moisture) forms the factor of " heavy elements " (20). The " air " (its oxygen content), " fire " (solar heat), and " aether " (sunlight) make up the factor of " light elements." The two series together affect the starch in the seed, bring about its change into glucose, whereby the seed swells until the plumule emerges, and the rootlets begin to penetrate the soil in search of " water " and " earth," while the leaves expand to take in the " air," and " aether " by the aid of " fire."

§ 88. Expressed in another way, there has been a change of vibration-rate. Or we might regard the imponderable elements as compulsorily riding upon the chemical elements during their metabolic interchanges, although the fire, water, earth or air cannot be thought of as retaining a sort of identity throughout. It would be better to use another idiom : the noumenal is coterminous with the phenomenal. Or, comparing it with wave-motion, it is as if there were two superimposed curves. When the two curves tally, every dip of one meets a dip in the other. The imponderable dips down, as it were, into the world of matter, illuminating the " ocean of physical matter " according to the mode (intensity of vibration) in which it touches the lower curve. At each rise of the wave, the former returns into the metaphysical " ocean," and in doing so, the physical matter returns to (momentary) inactivity.

The breaking down and building up of substance, in the course of metabolism, is the same as the scholastic " corruption " (disintegration), and " generation " (reconstruction); and is concurrent with the changes in the imponderable elements. In Avicenna the process is thought of in their terms, whereas to the physiologist the process is worked out in terms of the material chemical elements.

So, in Chinese philosophy, we are introduced to the alternating opening and closing operations of Nature, which are controlled by the " Law," as the pivot controls the opening and closing of a door " (p. 134). (Cf. with urooj-nasool in Sufic philosophy.)

§ 89. Hence we find that Thesis III is working out the dynamic consideration of the imponderables, under the title of " temperament." It is the action and " passion " between the opposites which results in " temperament." This conception carried through all aspects of man provides the explanation of the diversity which characterizes the unity—one human being.

Akhlak-i-Jalali[25] says: " In truth there is one and the same principle, which, if prevailing in the attempered elementary particles is equipoise of temperament, if produced in musical tones is excellent and delightful intervals, if apparent in the gestures is grace, if found in language is eloquence, if produced in the human limbs is beauty (' Though their beauty charm thee,' Quran, Sura 33, v. 52), if in the qualities of the soul equity. Of this principle the Soul is enamoured and in search, whatever form it may take, whatever dress assume " (Verses 625-630 of Gulshan-i-Raz; many other passages in this poem are equally applicable).

This therefore forms the introduction to Thesis III.

4. APPLICATIONS OF THE DOCTRINE

(*a*) *To biochemistry.*

§ 90. Starting with the conception of matter so far detailed, both statically and dynamically, and applying the dynamic aspects of the imponderable elements designated as a " dance," we may proceed to trace the chemical elements and compounds through the body, entering as they do in the form of solid and fluid articles of diet, or by means of respiration. The chemical elements are seen to be in a form which is sometimes " fixed " or " bound " (combined), sometimes " free." They pass into the tissues, and linger there for a longer or shorter time before passing out again. During practically the whole of this time they are combined, but at the actual moments of chemical interchange they become free or " nascent " —the moments when f becomes f'.

§ 91. It may be said that that moment of *nascence* is the focus, or the whole purpose, of the cycle of changes which occur in the body—anabolic and katabolic. That one moment is the opportunity for vital actions to actualize. That moment finds its location in this or that histological unit or tissue-element, which itself is, in a certain real sense, itself the actualization of that moment! This moment achieved, they become bound once more and steadily descend the ladder of metabolism until they are found once more outside the body. To quote from a deep thinker of the early Victorian age: "Nitrogen, like a half-reclaimed gipsy from the wilds, is ever seeking to be free again, and, not content with its own freedom, is ever tempting others not of gipsy blood to escape from their thraldom" (Religio Chemici,[78] p. 149).

§ 92. At this same vital moment of the cycle, there is a change of the *pivot of function* in the substances concerned. All the substances with which the subject of metabolism deals belong to the carbon compounds, whose structure is well known to be described with the terms straight chain, double-chain, ring-compounds, etc. With these forms of "skeleton" are associated the various "side-chains" which are to the others as the limbs to the body. All the familiar groups of biochemistry (paraffins, primary and secondary alcohols, aldehydes, acids, amides, ketones, ethers, sulphonic acids, albumoses, leucins, purins, diaminoacids, sugars, etc.) may be thought of as presenting a sort of individuality which depends more on the side-chains than on the skeletons, and yet the radicles of which these side-chains are composed owe their character more to stereochemical position or other relations than to the elements which belong to them. With change of formula there is no doubt a change of physical state (colloid, crystalloid), of electrical reaction and so forth. But the fact of change (Cf. § 83) is still more important, even than the change of personality or individuality (so to speak). The pivot of function changes from one element—carbon, e.g.—to another (nitrogen, sulphur, phosphorus, e.g.). The important thing is that from being carbon-centric, the physiological processes are nitrogen-centric, sulpho-centric, phospho-centric. Or, unicentricity gives place to duo-centricity (e.g. sulpho-ferro-centric), or perhaps multi-centricity (e.g. in albumen), because the function cannot pass on to a new pivot unless two or more other elements have come into special association.

For instance, in oxy-centricity, a compound constructed on the straight-chain skeleton (-C-C-C-C-) may become oxycentric, because the new basis is -C-*O*-C- (formation of anhydrides, esters, etc.). Here the important thing is that the centre of function is -*O*- and no longer -C-. In nitro-centricity, the change is associated with the appearance of -C-*N*-C-, the centre of function being now -*N*-, which is important. In sulpho-centricity, a compound with a group $\text{-C-}S\text{-O}_3\text{H}$ (thio-ethers, allyls, etc.) may arise; this is quasi-pathological for the human body, and however insignificant the -*S*- may be to the chemist maybe it is evident to the senses in virtue of a distinctive odour. Such compounds as sulphocyanides, taurocholates, indoxylsulphates, melanin, various mucins, lardaceous substances, hair, and the horny skin have an importance of their own, and some of them form the links between nitro-centric and sulpho-centric compounds. In phospho-centricity, the dominance of the phosphorus atom is the culmination of the purpose of the metabolic change. So the author of *Religio Chemici* (p. 149) said "phosphorus is in the active condition at the centres of vital action and in the passive (allotropic) state at the outlying points." In the case of lecithin, there are variations of centricity. Its nitrogen, phosphorus, or hydroxyl may be dominant according to the metabolic circumstances, and the subsequent linkages and fate of each successive derivative is according to those circumstances.

Other elements may come to form important pivots of function, under more or less exceptional conditions (e.g., arsenic, silicon, etc.).

§ 93. It is clear then, that we can watch the metabolic processes from the chemical side as a sort of pageant or procession. But if we view it as the chemist does, according to syntheses and analyses, oxidations and reductions, and according to the intermediate products which he discovers when he arrests that pageant, as one might stop a dance in order to be sure that a certain individual was present or not, we may easily come to conclusions quite at variance with the living truth. Stop the dance, and the illusion is destroyed. The life has gone!

The living cell does not necessarily follow the programme of the laboratory. Indeed it might be doubted whether any substances as such ever appear except at the end. The actual process might well be like a shuffling of cards, whereby the order of the cards is altered and the order or relative position is the important thing. On the anabolic side there is always the face; on the katabolic side there is always the back. Between the two there are always the same atomic personalities which remain as it were in the same room but change about to receive different ranks with respect to one another.

Each element may be traced through its various phases, through compound after compound, its behaviour being modified by the side-chains, and its importance altered, so that now it has a regal position, with the others as its slaves, and now is reduced to slavery, subservient to another element which has now assumed the royal position. Each in turn receives homage from its fellows; each enjoys a brief reign upon the throne.

§ 94. Such is the chemistry of life, viewed mystically. It is an incessant movement. Interchanges proceed continually, and not only in one substance at a time, but in a thousand at a time; not one element only (C, H, N, O, S, P) but all of them simultaneously—not necessarily one ruler, but sometimes co-rulers, in the various substrates of action; not all at the same rate, but at different rates and with different rhythms.

§ 95. (*b*) *In histology*.—These pictures of biochemical processes must be linked up with what we actually see with the naked eye and with the microscope. Morphological changes are all manifestations of the unseen or invisible biochemical cycles. Not "structure first, then function." Not "function first, then structure." The two are inseparable both in time and place. Hence, however exact his histological knowledge, the physician must hold clearly before him the activities which only the mind can hold and piece together and watch. The histological appearance shows us the processes arrested at a particular moment when some group is dominant and another "recessive." Its very appearance is artificial, the produce of reagents acting upon a dead "fixed" protoplasm; a reaction between complex dyes and the chemical substances produced by the fixatives. That which appears to be the permanent substrate for functions, a definite scaffolding, is quite otherwise. In the picture given of the dance of the elements in the body, the "skeleton" seems a base from which side-chains arise and give purchase for the "dancing" element; but as a matter of fact the skeleton, the side-chain, and the element are mutually necessary. The whole structure is altering the whole time. So with the tissue. The change of chemical substances entails a change from solid to colloid, colloid to fluid, fluid to gas or back to colloid; and while so doing they become perceptible under the microscope as cell-substance, cell-fluid, cell-juice, tissue-juice; fluids aggregate and condense into "cells" (colloid phase); cells constantly dissolve or "splay out" into fluid, or undergo partition from larger and larger particles into submicroscopic and finally into visible microscopic particles, or else undergo partition into "supernatant fluids" of simpler chemical composition. In the course of these changes solids and the like separate out; and these last are usually but faultily regarded as products of metabolism comparable to the goods manufactured in a factory. The appearance of granules rather than fluid, or precipitate rather than solution in the tissue, depends on the kind of elements concerned (mineral atoms, ordinary atom-groups), and the direction of interchange. See § 125.

Some examples of the steps of the cycle towards visibility;

Fluid phase.	*Colloid phase.*	*Submicroscopic character.*	*Microscopic appearance.*	*Fate.*
Homogeneous "humour"	Cell-substance	Spongioplasm	Tissue cell as a whole	Excretable substance and protein derivatives.
Abnormal "humour."	Atrabilious humour	Less colloidal	Coarse particles (insoluble)	Inexcretable without medicamentous aid.
Tissue-fluid	Serum-protein	Aminoacids	Bioplasm; occasional crystalline deposit	Urea, etc.
Sulphur	Colloid Sulphur potentially excretable phase.	Larger particles of Sulphur	Cell-granules, cell-wall	Sulphur derivatives; sulphonic acids, etc.

§ 96. It is not possible to prepare a fully exact correlation between the carbon, nitrogen, phosphorus, and sulphur series and structure seen under the microscope. Broadly speaking, the carbon series is related to the cell-substance; the nitrogen and phosphorus series are associated with the nuclear structure. Certain kinds of cells are associated more with some elements than with others. Moreover one must always bear in mind that the movement is all through the cell, all through the whole histological unit. The fulfilment of the functions of such a unit implies the simultaneous movement of all the elements concerned, and each cycle proceeds at a different rate.

§ 97. It is less easy still to present a picture of the movement in a whole tissue in these terms. Only here and there does some product emerge which is identifiable by the physiologist and biochemist. Endless intermediate steps and changes find their concrete expression in the one product which we perceive as some detail of cell-structure under the microscope. We may trace various isolated substances in certain parts of certain cells of the body, and yet are not able to dogmatize about them, because in the process of life in the tissue there is a constant flow of matter, the visible becoming invisible, and then again visible. That is, the visible food material taken in, the invisible changes and interchanges of elements and atom groups (the "metabolism") and their changing pivots of function; and the finally visible product of excretion. If there be a range of variation from a "normal" in the steps of this "dance" there is at least no doubt that ill-health comes of a change of rhythm when the "footfalls" are out of time, or some of the "steps" omitted.

§ 98. It is clear that if the changes in the imponderable elements should chance to fail to run concurrently with the breaking down and building-up of substance (the scholastic corruption or disintegration and generation or reconstruction), this would also mean a break in the rhythm; the wave-motion would not be symmetrical, to use the previous simile; and the body would be "ill." But it may be added, in passing, that the varying dispositions exhibited by people are the manifestations of lack of perfect symmetry and synchronism; perfect symmetry would show among other things as "a cheerful disposition."

§ 99. The histology of an organ is the visible sum total of chemical units, with the atom groups of ponderable elements successively formed in the cells and tissues. These constitute the stage and scenery of the metaphysical "dance"—that of the imponderable elements which interweave and complete the picture of the living processes. But to understand the picture itself, and see its meaning, brings us to questions which must be deferred at this point.

§ 100. The wonderful insight into the processes taking place in the human body which is afforded by the conception of "macrocosm" and "microcosm" used by the alchemists of old, and still rightly used by many thinkers, is sufficient justification.

In nature we see, for instance, a crowd of human beings, composed of hundreds of units which have aggregated for a relatively few moments. We may call it simply "a crowd," or we may specify and say what kind of a crowd. As one watches it, people come up to it; others leave; others walk by without deviating their steps. Perhaps in five minutes it has all dispersed.

What of it? What was its purpose? What was its effect?—here or perhaps elsewhere? Perhaps it is subversive of order, anarchical, pathological; perhaps it is simply mechanical, obstructive, congestive.

Such may be observed under the microscope, but we call the components cells or perhaps excretory products or foreign bodies. To some, such analogising is fanciful and useless. But that Avicenna found this method of enquiry vastly productive and helpful there is no doubt. As a faithful Moslem, too, he would realize the voice of the Quran, saying, "these things are to you for a sign." Words belonging not only to the moral law, but also to the law of Nature in all its ramifications—for the Artificer and the Lawgiver are one.

§ 101. By the time we have grasped these several aspects and associated them with the chemical aspect of life, we have formed a nearer approximation to the true picture of life *at that moment of time.* But it has already passed on to something different! However, there is no way of keeping pace with that except by understanding the cycle of changes in each and every case. Cycles of incipience, of growth, of maturation, of decay. The *reason*, or *cause* of the change, is to be understood before one can keep pace.

§ 102. *The causes at work in the dance of the imponderable elements.*—The mutual attraction and repulsion which underlies all change is to be found inherent in the imponderable elements, as it were by definition. The active and passive qualities of the separate elements come into play when they are compounded, and (because they necessarily occur in the same "geographical" spot, and are only separable by mental analysis) they have to do even with physical state (solid, fluid, colloid, gaseous) and form (granular, amorphous, crystalline) and physical property (solubility and insolubility; positive or negative electrical charge). Hence they may be said to affect the *direction* of movement, whether to less colloid state, or more colloid, to differentiation or de-differentiation, clearness or sharpness of reaction, or to confused state.

§ 103. This doctrine may be brought beside the Chinese principle of Yang and Yin.

To the Yang principle belong the ideas: anterior, south, rising, fecundating, expanding, growth, advancing, strength, order, heat, motion, cheerfulness, life.

To the Yin principle belong: posterior, north, falling, breeding, contracting, decay, retarding, weakness, confusion, cold, rest, anger, death.

In relation to the body: Yang belongs to the breath, the head, the speech, the eyesight, exhaling; the shape of the body. Yin belongs to the blood, the feet, the vital force, silence, inhaling; the "body" itself.

Yang is active, flowing, fullness, straightness, music. Yin is passive, tending to inertia, emptiness, crookedness of form, ceremonial.

There are relations between yang and yin, and hardness or softness, and the organs of the body. (Forke[22], 216).

"When the ether has the proportions of the yin, and the yang correct and harmonious, there is perfection of the ether, and it is equally permeable by all five elements, as in the case of man. When the proportions are unequal, there is imperfection of the ether, the manifestation of the elements is unequal, as in the case of animals."—BRUCE,[10] footnote: i. 115.

§ 104. The idea of Yang and Yin swinging as a pendulum may add to our conception of life. The rocking of the cradle has the subtle purpose of throwing the yang and yin into rhythm, and the movement of the infant's breath into rhythm, which, once started, will continue for at least an hour or two. (See **698**.)

§ 105. *Urooj: Nasool.*[38] Rise and Fall. The anabolic process belongs to the former; the katabolic (formation of "effete" substances, their removal from tissues and organs—whether by deposition in tissues, as atheroma, or by discharge from the body) belong to the latter. These terms in Persian mysticism emphasize the fact of changes and movements running in cycles. Each individual has his own characteristic cycle of changes; the movement of the "breath" goes by cycles. The life as a whole shows its cycle, being sometimes 75 years, sometimes more, more often much less. In addition there are the smaller cycles—waxing and waning of vital force in a certain rhythm peculiar to the person, and carrying with it susceptibility or resistance to infection, and the like.

§ 106. *Other principles*: these would be expressed as laws, which can be classified into various groups—those belonging to nature in general; those belonging to human nature; those belonging to our conceptions of life, health, and disease. Law of qaḍā and qadr; construction and destruction; of distribution; of interdependence; of intention; of compulsory visibility (discontinuous functions, etc); of desires. Note § 82.

§ 107. *Cause of synchronism*: namely between the two dancers in the simile; these dancers being the material element and the imponderables respectively. This lies in the conception of "breath" or "life-principle," with its cycles.

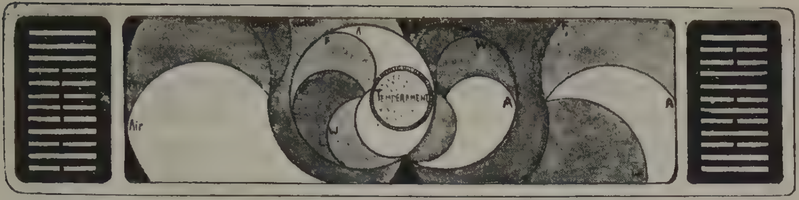
§ 108. (*d*) *Extramundane and extracorporeal influences on the human body in virtue of the common content of the "four elements."*

That there are definite extracorporeal influences on the metabolic workings of the human body should now be intelligible. The effect of heat, cold, wet climate, dry climate is well enough known but is widely ignored, as evidenced by elaborate researches into chronic articular "rheumatism" being apparently made in every direction but this.

To go further, and agree with the ancients that epidemics and the like had relation to planetary influences, is not necessary; nor is it necessary to dismiss their possibility off-hand. It is not safe to argue that there is no relation between the planets and stars and life on this earth simply because some relation once thought to be true is now discredited. If the whole universe is one organic whole, there cannot but be some relation.

The relation between seasonal irregularities and the interactions of the "elements" is referred to by Forke[23] (p. 298, footnote), in showing how the Chinese associated each season with the dominance of a given element.

According to the influences prevailing at the time of birth, so is the endowment of the person born "with such an ether." If "toward, the disposition is bright and good . . . if untoward, not." Chu Hsi[10], 85. In time, and with constant self-culture, "the inequality of etherial endowment will of itself disappear." ib., 86.



THESIS III

26.

I. The Temperaments

TEMPERAMENT is that quality which results from the mutual interaction and interpassion of the four contrary primary qualities residing within the (imponderable) elements.

There is a fight between the qualities; a combat (Costaeus' annotation). "The temperament is something set up by contrary qualities as a kind of mean between them." (S. Thomas,[82] lxiii. p. 165, where "complexio" is rendered "temperament" as it is throughout the present work.)

"How strange that the elements should be so contrary,
And yet be forced to live together."

Gulshan-i-Raz,[25] p. 26.

27. These elements are so minutely intermingled as each to lie in very intimate relationship to one another. Their opposite powers alternately conquer and become conquered until a state of equilibrium is reached which is uniform throughout the whole. It is this outcome that is called "the temperament."

"Elementum aliquod oportet predominari in omni mixto."[83] 49, 6, i. m; 79, 2, 2m.

"This is a drawn battle." (Costaeus [18].)

In the design forming the heading of this page, four transparent discs are shown superposed. The discs represent the primary qualities. The tinted segments represent the imponderable elements. The central ring marks off the superposed discs as viewed together in one "temperament." As each disc revolves, different tints come into new positions, and thus represent different temperaments as met with in different individuals.—The lateral figures serve to recall the principles of the "Book of Changes."

The initial letter is taken from a French manuscript of the twelfth century.

28. Inasmuch as the primary powers in the aforesaid elements are four in number (namely, heat, cold, moisture, dryness), it is evident that the temperaments in bodies undergoing generation and destruction (ana-, kata-bolism) accord with these powers.

30. A simple rational classification is into two modes : (*a*) *Equable* or balanced. Here the contrary qualities are present to exactly equal degrees of potency—neither of them being in excess or deficiency. This temperament has a quality which is exactly the mean between two extremes. (*b*) *Inequable* or unbalanced. Here the quality of the temperament is not an exquisitely exact mean between the contraries, but tends a little more to one than to the other. For example, to hot more than to cold ; to moist more than to dry ; or contrariwise.

" One or other proves victorious." (Costaeus.)

" Fire, water, earth, and air, the four elements of which bodies are compounded, lose their individual qualities in the compound bodies, and equipose (equity) is what unites them into homogeneous compounds." (Lahiji,[25] p. 61).

" When . . . the elements attain equilibrium, the beams of the spirit world fall upon them." (*Ib.*, couplet 615.)

"When it is said that the nature of a man or thing is hot and of another is cold, such statements include both the physical element and the immaterial principle with which they are endowed." Chu Hsi[10], i. 94.

The idea of " balance " may be applied to a variety of phenomena in health and disease—both of body and mind. Lack of balance brings sickness, and explains death. Examples :—atony ; hypertonicity ; hyperacidity ; excessive trichosis ; the various phenomena nowadays ascribed to loss of balance in the domain of endocrine secretions, and hormones. The body may be too cold (subnormal temperature) ; the mind may be " cool " ; the heart may be too " warm." There may be inadequate repose after mental activity, leading to loss of mental balance. There is dynamic balance as well as static balance.

31. (It is to be noted that) a temperament, as understood by Medicine, is never strictly equable or strictly inequable. The physician should abide by the philosopher who is aware that the really " equable " temperament does not actually exist in the human being any more than it exists in any " member." Moreover the term " equable," used by doctors in their treatises, does not refer to weight but to an equity of distribution. It is this distribution which is the primary consideration—whether one is referring to the body as a whole, or only to some individual member ; and the average measure of the elements in it, as to quantity and quality, is that which (standard) human nature ought to have—both in best proportion and in equity of distribution.

As a matter of fact, the mean between excess and deficiency of qualities, such as is characteristic of man, actually is very close to the theoretical ideal.

The fact that temperament is concerned with the primary qualities and not with secondary ones should enable one to avoid the idea of weight (pondus) in regard to the subject. In the annotation of the 1608 edition there is a reference to Averrhoes, as agreeing with this point. However, if one realises that the " elements " are " imponderables," it becomes self-evident that Avicenna's dissertation is correct, and that he himself quite realised the attitude claimed for him in this treatise.

32. *Eight varieties of equipoise* :—Human beings show eight varieties of equable temperament. Equipoise of this kind does not occur in animals, nor do these even approach to the equable state we describe for man.

See also § 109 and the quotations there given, which insist on the fundamental difference between man and animals.

The eight varieties are as follows :—

A. *In relation to beings other than man.* (i) the equability of temperament seen in man as compared with other creatures ; (ii) that which is found in different human beings ; (iii) that which is taken in relation to external factors, such as race, climate, atmosphere ; (iv) one taken in comparison with the temperament of extremes of climate.

B. *In relation to the individual himself.*

(v) as compared to another person ; (vi) as compared with the states of one and the same person ; (vii) as compared, one member with another ; (viii) as compared with the states of one and the same member at different times.

33. We now discuss each of these modes in turn.

i. Equability of temperament as found in man taken in comparison with that of other animals. The range is too wide to be comprehended in one definition, although there are certain definite limits, upper and lower, beyond which one cannot pass without the temperament ceasing to be a human one.

ii. This is one which is between the two extreme limits of the range of temperament shown by a person throughout his life (*p*)—namely that shown at the period of his life at which growth has reached its limit. This, of course, is not the equilibrium referred to at the outset of this chapter as only theoretical, and practically never found in practice—though approximating closely to that. Such a person is so near to approximate equability only as far as corresponds to the co-equation of his members, or the interchanging contra-action of his hot members (e.g. heart), with his cold ones (e.g. brain); moist ones (e.g. liver) with dry (e.g. bones). Were all these of equal influence, the resulting condition would be very near to one of ideal equability, though not so as regards each individual member, except in the case of the skin itself, as will be explained later. In regard to the breaths and principal organs, the temperament cannot possibly approximate to this exquisite equability; it oversteps this in the direction of heat and moisture. The heart and the breath are the root of life, and they are both very "hot"—indeed to excess. For life itself depends on the innate heat, and growth depends on the innate moisture. Indeed the heat is present in and maintained or "nourished" by moisture.*

In the case of the principal organs, of which there are three, as we shall show in the appropriate place—the brain is cold, but its coldness does not modify the heat of the heart and liver. The heart is dry or nearly so, yet its dryness does not alter the moisture of the brain and liver. Neither is the brain absolutely and entirely cold, nor the heart absolutely and entirely dry. The heart is dry *compared with* the other two; and the brain is "cold" *compared with* the other two.

iii. The limits of the *third mode* are narrower than those of the first, although still quite wide. This is a special equability peculiar to the race, climate, geographical position or atmosphere. The Hindus, in health, have a different equability to the Slavs, and so on. Each is equable in regard to their own race, but not in regard to others. So if a Hindu were to develop the temperament of a Slav he would probably fall ill, and might even die. So, too, if the temperament of a Slav should come to be that of the Hindu, for the state of his body is contrary. So it seems that the various inhabitants of the earth have received a temperament appropriate for the conditions of their particular climate, and in each case there is a corresponding range between two extremes.

iv. The *fourth mode* is one which is a mean between the two limits of the range of the climatic temperament. It is more attempered than the temperaments of the third mode.

v. The *fifth mode* presents a much narrower range than the first or third mode. It is the temperament peculiar to each separate person, in that he is alive, and also in health. It shows a range between two extremes—upper and lower. One must realize that every individual person has a temperament entirely peculiar to himself, and it is impossible for any other person to have an identical temperament, or even to approximate thereto.

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* Fire "feeds on" air. So innate heat consumes the innate moisture (Costæus[18]).

vi. The *sixth mode* is intermediate between those two limits. When the person has this mode of equability of temperament it will be the most suitable for him.

vii. The *seventh mode* is the equability of temperament characteristic for each of the several members of the body, for each is different from the other. In the case of bone, the equable temperament has dryness more than other qualities ; in the case of the brain, moistness is more conspicuous ; in the case of the heart, warmth ; in the case of the nerves, coldness. Here also there is a range—upwards or downwards—consistent with equability, but less than in the before-named modes.

viii. The *eighth mode* is that form of equable temperament which is proper for each given member. When it has this particular temperament it is in the best state possible to it.

34. When we study the matter we find that of all beings, man is most near to the ideal equable temperament. Of all races of men, those who live in countries within the equinoctial circle, away from mountains and seas, approach the ideal equable temperament more closely than others, and those living in other countries. It is asserted that the more nearly overhead the sun is [i.e. in the torrid zone], the greater does the temperament of the people deviate from the ideal equability. But this is false, for when the sun is overhead it is less harmful, and alters the atmosphere less there than it does with us, or less for those at greater latitudes than for us—though of course we do not have it overhead.

In the case of peoples living in the equinoctial zone, the states of the body are in all cases more like the ideal ; the atmosphere in these regions exerts no evident deleterious effects, but is always in harmony with their temperaments. We have already (elsewhere) expressed our agreement with this opinion.

In the case of peoples living in the fourth climate, they are more attempered. The sun's rays are not overhead long enough to scorch them, but are not as oblique as in the second and third zones of the earth. Such people are not exposed to cold from great obliquity of the sun's rays, as occurs in the case of peoples living at the extreme edge of the fifth climatic zone.

35. It has already been stated that the chief organs do not approach closely to the ideal equability of temperament. Of all members the flesh comes nearest to the ideal; the skin comes next, for it is hardly affected by attempered water (i.e. water prepared by mixing equal parts of snow water and boiling water). It may be that the flesh is so well attempered because the heat of the breath and blood within it is balanced by the coldness of the nerves. And there is also the fact that it is not subject to the influence of the body itself, for the fact that drier and moister elements are equally present in it accounts for it being well attempered. We know too that its absence of sensation is another reason why it is not subject to the influence (of the body). It is only subject to intrinsic factors, or dissimilar qualities. For, as we know, when things have a common origin, but are opposite in nature, mutual interaction results, whereas a thing is not affected by anything whose quality is similar to itself (*p*).

36. The most attempered part of the skin is that of the hands. The most attempered part of the skin of the hands is that of the palms and soles. The most attempered part of the skin of the palms of the hands is that of the finger-pulps. The most attempered part of the skin of the finger-pulp is that of the index. The pulp of the tip of the index-finger is the most sensitive, and that of the other finger tips is more sensitive than other parts, because they judge of the nature of tactile qualities. There must be a lessening of sensitiveness from the middle outwards in order that one can perceive a deviation from equability.

> "The more the organ of touch is reduced to an equable complexion, the more sensitive will be the touch." (S.T.,[84] 76, 5; p. 44, trans.)

37. In saying a medicine is of equable temperament, we do not use this expression in the absolute sense, because that would be an impossibility. Nor do we mean that it is attempered correspondingly to the human temperament, for in order to be that the medicine would have to be actually composed of human substance. We mean this—that when the medicine is exposed to the action of the innate heat within the human body, its quality will not over-reach either of the limits (of equable temperament) proper to the human being. Consequently it will not produce an effect beyond those limits. Therefore, in regard to its actions within the human body it is attempered, of equable temperament.

Similarly, when we say a drug is hot or cold, we do not mean an absolute heat or coldness of substance, or that it is hotter or colder in substance than is the human body. Otherwise it would imply that the drug has a temperament like that of man—equable. What we mean by the statement is that through the drug hotness or coldness comes to the body, in a degree over and above that degree of heat or cold which is in the body already. Consequently a medicament may be at the same time cold—that is, compared with the human body—and hot—that is, compared with the body of a scorpion; it may be at the same time hot—that is, compared with the human body—and cold—that is, compared with the body of a serpent. More than that, a medicament may be hotter towards the body of Peter than it is to the body of Paul. It is important to know this when choosing medicines with the object of altering the temperament. One must take care not to employ a medicament which from its very nature could not have the effect desired.

38. Now that we have explained the subject of equable temperament sufficiently we pass on to consider *the inequable temperaments* ("*intemperaments*," dyscrasias).

They are classified according to race, individual, and organs. There are eight variants, all of which agree in being contrary to the eight equable temperaments named above.

(A) the simple types show a deviation from the normal equipoise only in respect of one contrary.

(B) the compound types show a deviation from the normal equipoise in respect of two contraries at once.

39. A. The *simple intemperaments* are as follows:—

(*a*) where it is an *active* contrary quality which is in excess:
  (i) hotter than it should be, not moister or drier. Hot intemperament.
  (ii) colder than it should be, not moister or drier. Cold intemperament.

(*b*) where it is a *passive* contrary quality which is in excess:
  (iii) drier than it should be, but not hotter nor colder. Dry intemperament.
  (iv) moister than it should be, but not hotter nor colder. Moist intemperament.

These four intemperaments are only temporary, for when too hot, the body becomes drier than it should be; when too cold, the body becomes moister than it should be, by assuming extraneous moisture; when much too moist, coldness supervenes more rapidly than dryness would. If the dryness be not very great, the body may remain in that temperament for a considerable time, though ultimately it will become colder than it should be.

It will be clear, then, that equipoise and health depend more upon heat than upon cold.

So much for the four simple intemperaments.

40. *The compound intemperaments.* The four compound intemperaments are those in which there is a departure from equability in respect of two contraries. Thus, the temperament may be at the same time hotter and moister than it should, hotter and drier than it should, colder and moister than it should, colder and drier than it should. Obviously it cannot be simultaneously hotter and colder, or drier and moister.

41. Each of these intemperaments is further subdivisible into two forms (thus making sixteen intemperaments). (*a*) Those apart from any material substance—(qualitative ; formal). Here the temperament is altered only in regard to one quality, because the fluid pervading it has the same quality as that towards which the body is being changed as a whole. Yet it does not do so unless it be in virtue, e.g., of heat (in fever) or cold (extraneous cold).

(*b*) Those in which some material substance is concerned (material). Here the body is only affected by the quality of the intemperament in virtue of the increased amount of some particular body-fluid. For instance, the body is cooled by vitreous serous humour ; heated by leek-green choleric humour.

42. Examples of the sixteen intemperaments are given in the third and fourth volumes.

43. Intemperaments in which some material substance is concerned occur in two modes : a member may be pervaded by the material substance entering from without, or it may be pervaded by the material substance which has reached the tissues of the body and fails to get out through the orifices of the channels or from the cavities of the body. Such retention of material may be the beginning of the formation of an inflammatory mass.

This completes the chapter on intemperaments.

44. The physician is again reminded that he must seek an explanation of the deeper intricacies of this subject in [esoteric] philosophy, for they are not self-evident.

2. The Temperament of the Several Members

45.

ALLAH most Beneficent has furnished every animal and each of its members with a temperament which is entirely the most appropriate and best adapted for the performance of its functions and passive states.—The proof of this belongs to philosophy and not to medicine.

" An artificer produces divers works of art. (S. Thos,[84] 65, p. 186.)

" Every creature exists for its own proper art and perfection." (*Ib.*, p. 184.)

46. In the case of man, He has bestowed upon him the most befitting temperament possible of all in this world, as well as faculties corresponding to all the active and passive states of man. Each organ and member has also received the proper temperament requisite for its function. Some he has made hotter, others colder, others drier, and others moister.

§ 109. " The human body is the most noble of all lower bodies, and by the equability of its temperament is most like the heaven which is free from all contrariety."[82] (i. 70, p. 178 trans.)

" He gave each thing its limits and all things their disposition." (*ib.*, ii. 26, p. 49.)

" God makes man after one type and a horse after another; the types of things are manifold in the divine mind." (*ib.*, i. 54, p. 118).

" Lord, Thou hast ordered all things in number, weight and measure." (Wisd. xi. 21.)

" There is diversity and inequality in things created—not by chance, not as a result of diversity of matter, not on account of certain causes or merits intervening, but from God's own intention; in that He willed to give the creature such perfection as it was possible for it to have."[82] (ii. xlv, p. 108)

We may also quote from the Chinese.—" All beings possess the five imponderables, but only man has them in perfect balance as the constitution of his Nature." " That which differentiates man from the brute is his possession of the Mean or Equilibrium, that perfect balance of the elements in the constitution of his Nature of which Tzu-Ssu teaches in his famous classic—the Doctrine of the Mean." (Chu Hsi,[11] 214, 217.)

" In the life of men and other creatures, the Nature with which they are endowed differs from the very beginning in the degree of its perfection. But even within the differing degrees of perfection there is the further variation in respect of clearness and translucence." (Chu Hsi,[10] i., p. 57.)

"When the ether received is limited, the immaterial principle received is also correspondingly limited. Thus, the physical constitution of dogs and horses being as it is, their functions are correspondingly limited in their range." (*ib.*, p. 60.) "Man receives the ether in its perfection, and the ethical principle permeates it completely and without impediment; while in the case of other creatures, in which it is imperfect, the ethical principle is impeded and unintelligent. He receives the ether of the universe in its perfection, and therefore possesses moral and intellectual faculties." (p. 67.)

"In birds and animals, though they possess the Nature, it is restricted by the corporeal element, which creates an impenetrable barrier"[10] (p. 61.)

47. In order of degree of Heat.

1. The Breath is the hottest, and the heart in which it arises.
2. The Blood. Though this is generated in the liver, it derives more of its heat from the heart than from the liver, the two organs being in continuity.
3. The liver, which may be looked upon as concentrated blood.
4. The "flesh," which would be as hot as the liver were it not for the nervous tissue (cold temperament !) which pervades it.
5. The muscles which are cooler than the "flesh" because of their tendons and ligaments, as well as the nerves.
6. The spleen. The faex of the blood makes this colder.
7. The kidneys contain relatively less blood.
8. The walls of the arteries. These are warm in spite of the nerve substance present, because they receive heat from the blood and the breaths within them.
9. The walls of the veins, which owe their heat to the blood alone.
10. The skin of the palms and soles.

48. In order of degree of Coldness.

1. The coldest thing in the body is the serous humour.—2. Next in degree, the hairs.—3. The bones.—4. The Cartilage.—5. The ligaments.—6. Tendon.—7. The membranes. 8. The nerves.—9. The spinal cord.—10. The brain.—11. Fat.—12. The oil of the body.—13. The skin.

(In general, organs rich in blood are of hot temperament; those poor in blood are of cold temperament.—Aegineta.)

49. In order of degree of Moisture.

1. The serous humour is the most moist constituent of the body.—2. The blood.—3. The oil.—4. The fat.—5. The brain.—6. The spinal cord.—7. The breasts and testicles.—8. The lung.—9. The liver.—10. The spleen.—11. The kidneys.—12. The muscles.—13. The skin.

The order here given is that of Galen, but in the case of the lung the moisture is not inherent in its nature but is derived from the nourishment which comes to it. The lung is fed by a very " hot " blood, because there is much bilious humour in the blood going to the lung. A great excess of moisture accumulates in the lung from the gaseous products of the whole body as well as from the materials which flow down to it from the " head."

In actual fact the liver is intrinsically moister than the lung, whereas the lung is as it were constantly sprinkled with moisture ; it is the fact that the moisture lingers in it that makes it so soft (to the feel).

One should conceive of the states of the serous humour and blood in a similar way. The serous humour is moist in that it is as it were sprinkled with moisture. In the case of the blood the moisture interpenetrates, pervades, and grows through its very substance. It is true that the serous humour, watery in nature, generally possesses much more moisture in itself than the blood does. And if the digestive changes in the blood proceed inadequately it loses not a little moisture—namely, the moisture of the naturally watery serous humour, which has become part of the blood. As we shall see later, the normal serous humour is nothing more than imperfectly digested blood.

50. In order of Dryness.

1. The driest thing in the body is the hair, for this comes from the ethereal element carrying up with it the material dispersed to it from the rest of the body, which is then left behind in the hair as pure fumosity.

2. The bone. This is the hardest of all the members. It is however moister than hair, because bone is derived from the blood, and its fume is dry, so that it dries up the humours naturally located in the bones. This accounts for the fact that many animals thrive on bones, whereas no animal thrives on hair—or at least it would be a very exceptional thing if hair ever did provide nourishment. Some think that bats can digest hair and live on it. The proof that bone is moister than hair is that when equal weights of bones and hair are distilled in a retort, more water and oil will flow and less " faex " will remain.

3. Cartilage.
4. Ligaments.
5. Tendon.
6. Serous membranes.
7. Arteries.
8. Veins.
9. Motor nerves.
10. Heart.
11. Sensory Nerves.
12. Skin.

The motor nerves are colder and drier at the same time, and are therefore in equipoise. The sensory nerves are colder but not drier in proportion, and are probably very nearly in equipoise, since their coldness is not very far distant from that of the motor nerves.

§ 110. *Link between soul, passions, temperament.* S. Thomas[84] writes (ii. 63, p. 166): "The soul rules the body, and curbs the passions that result from the temperament. For by temperament some are more prone than others to desire or anger, and yet refrain more from these things."

3. THE TEMPERAMENTS BELONGING TO AGE

SEX, PLACE OF RESIDENCE, OCCUPATION

51. There are four periods of life.

Period.	Title.	Name.	Years of age.
I.	The period of growth.	Adolescence.	Up to 30.
II.	The prime of life.	Period of beauty.	Up to 35 or 40.
III.	Elderly life.	Period of decline. Senescence.	Up to about 60.
IV.	Decrepit age.	Senility.	To the end of life.

In the third period, the best vigour has passed, and the intellectual power begins to decline.

In the fourth period, vigour and intellectual power both obviously decline.

52. The First Period of Life.

Sub-division	Name.	Distinctive Characters.
First.	Infancy	The period before the limbs are fitted for walking.
Second.	Babyhood.	The period of formation of teeth. Walking has been learnt, but is not steady. The gums are not full of teeth.
Third.	Childhood.	The body shows strength of movement. The teeth are fully out. Pollutions have not yet appeared.
Fourth.	Juvenility. " Puberty."	The period up to the development of hair on the face and pubes. Pollutions begin.
Fifth.	Youth.	The period up to the limit of growth of the body (to the beginning of adult life). Period of athletic power.

The temperament during the whole of this period of life is almost equable as regards " heat," but " moisture " is in excess. There has been not a little controversy among older writers about the degree of heat during the period of juvenility as compared with that of youth. Some argue that the heat is greater in the former than the latter, and that this accounts for their growth, and for the fact that their natural functions of appetite and digestion are greater in vigour and persist longer. This, it is considered, is due to a condensation of the innate heat derived from the sperm.

53. Others argue that the innate heat of youth is far greater than that of juvenility, because (*a*) their blood is much more plentiful and is thicker—evidenced by the frequency with which nose-bleeding occurs ; (*b*) their temperament approaches that of bile, whereas that of juvenility approaches that of serous humour. (The evidence of an undue proportion of bilious humour in a temperament is (i) that the diseases in such a person are " hot "—e.g. tertian fever ; (ii) the vomitus is bilious ; (iii) other facts.) (*c*) The movements of the body are more energetic in youth ; and bodily movement requires plentiful innate heat. (*d*) Digestion is better and more vigorous ; and this entails expenditure of heat. The signs of a vigorous digestion are : absence of feeling of nausea ; absence of fermentative vomiting ; absence of crudity or aversion to food. These occur in juveniles when their digestive power is disturbed. (*e*) The appetite is less in youth than in juvenility. This shows that the innate heat is greater, for the appetite is better in a cold temperament. A dog's appetite is often accounted for by cold temperament. (*f*) The process of growth, greater in juveniles, requires adequate moisture rather than heat. (*g*) The diseases to which juveniles are liable are usually cold and moist ; and when fevers occur in them, they are pituitous. If vomiting occurs it is usually serous.

These then are the two theories and the facts on which they are based.

54. *Galen's teaching.*—Galen is opposed to both. In his opinion the heat is actually the same in each. The difference is that in puberty its quantity is great but its acuity is less. In youth the heat is less in quantity but greater in acuity. As he says—let us imagine first a single measure of " heat," or a subtle body of unit heat, penetrating into an abundance of moist substance—as it might be, water. Then imagine a unit of heat penetrating into a small bulk of stone. The heat in the water would then be large in quantity but soft in quality, whereas the heat in the stone would be less in amount but of great acuity. This is analogous to the state of affairs in regard to the heat of juvenility and of youth.

55. Juveniles derive their (innate) heat from the sperm, which is very " hot." This initial innate heat is being steadily used up, but the loss is made up by the progressive growth ; indeed it is more than made up.—But during the period of youth, there is nothing to make good such loss of innate heat. On the contrary, the degree of innate moisture is lessening both in quantity and quality,—this being the mechanism by which the innate heat remains at a constant level up to senescence. Ultimately, the moisture is in too small a proportion to enable the innate heat to be maintained constant. During all this period there is no corresponding growth.—At the outset of life, the innate moisture suffices for the two requirements—maintenance of innate heat ; growth. But there comes a time when one or other or both must fail. Innate heat must be adequate to enable growth to take place, yet the basis of growth—innate moisture—is failing. So how can growth possibly continue ? It is clear then, that growth must cease, for it cannot be that the innate heat should be sacrificed. This is " the tongue of the case "[104] (iii. 347) during the period of youth. (*p.*)

56. As regards the second theory—that during juvenility growth is in virtue of moisture rather than in virtue of heat—This cannot be true because moisture (*m*) is the material cause of growth and *m* does not unfold or construct itself ; it is not a self-created " *being* " : it only changes in virtue of a formative power (*f*) acting upon it. As a matter of fact this formative power is *F*—the " soul," or " nature "—that which is in the decree of Allah ('umr-i-Allah). This " nature " requires an instrument wherewith to work, and this instrument is the innate heat.

57. So, when people assert that the voracious appetite of juveniles proceeds simply from their cold temperament, this also is wrong. A morbid appetite due to coldness of temperament cannot result in good digestion and nutrition. As a matter of fact the digestion during the age of juvenility is usually of the very best. Growth of the body as a whole implies that more food is being assimilated than is used up. When digestion is faulty, the cause is either (*a*) gluttony, eating food voraciously or inordinately ; or (*b*) errors of diet—partaking of a diet badly designed and including articles of food which are unwholesome, or moist in temperament, or in excess ; (*c*) neglect of the movement of the bowels and other emunctories, whereby effete matters accumulate and become knit together in them (which is an indication for purging)—(*d*) other emunctories : the lungs especially need "purgation" by making the respiration deeper and quicker ; although its power is never as great as it sometimes is in the second period of life.

This completes Galen's teaching about the temperaments of juvenility and youth.

58. One must also bear in mind that the innate heat of the body begins to fail after the prime of life, because the ambient air dries up the moisture of the body—and the moisture is *m* of of the body.*

The innate heat also helps to dry up this moisture. So also does the effort involved in the performance of the corporeal and emotional activities inevitably associated with life.

59. Drying up of the moisture is also aided by the failure of the " nature " to withstand the steadily and silently increasing dissipation of the faculties. All the faculties of the body are finite in duration, as is well-known to natural science. So also the innate heat is not being replaced for ever. Even were the innate heat infinite in duration and always bringing about its changes in the body, so as to maintain a renewal equal to the loss, the fact that the loss is increasing steadily day after day inevitably leads to a limit beyond which the loss could not be made good. A fixed state of dryness would be bound to come. How much sooner would not this time arrive did both factors contribute simultaneously towards it ?

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* The body is admittedly 95 per cent. water !

60. We see then that the *m*, the moisture of the body, must inevitably come to an end, and the innate heat become extinguished—and the sooner if another contributory factor to its destruction be present; to wit, the extraneous excess of humour arising out of imperfect digestion of food. This extinguishes the innate heat (*a*) by smothering it, enclosing it, and (*b*) by providing the contrary quality. This extraneous humour is called the "cold serous humour."

61. This is the death of "nature" to which every person is destined, and the duration of life depends on the original temperament, which retains a certain degree of power to the end by fostering its intrinsic moisture. This is the person's appointed end, and the diversity of temperaments accounts for the different durations of each one's life. These are the natural terms of life. (There are of course, also, premature deaths, brought about through other causes, though even these are also in accordance with Divine Decree.)

"All things have We created after a fixed decree." (Q. 54, 49.)

"The four elements are as birds tied together by the feet;
Death, sickness and disease loose their feet asunder.
The moment their feet are loosed from the others,
The bird of each element flies off by itself.
The repulsion of each of these principles and causes
Inflicts every moment a fresh pang on our bodies.
That it may dissolve these composite bodies of ours,
The bird of each part tries to fly away to its origin;
But the wisdom of God prevents this speedy end,
And preserves their union till the appointed day."

Mesnavi,[87] p. 162.

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§ 111. The "death of nature" may also be explained on the basis of *urooj* and *nasool* (§§ 105, 137), for when the positive and negative phases in the cycle of the elements and of the breath clash—that is, enter the phase of *kemal* (Persian term) the bodily functions all cease. The *kemal* phase may be reached long before the allotted span.

§ 112. The presence of this phase, and its probable duration before death actually occurs, may be discerned in practice, if the law be understood. This fact throws a significant light on the statements in the Chinese work on the pulse,[98] where the time of death is foretold from the study of the pulse and other factors—assigning not a number of hours, or days, but a particular period in the lunar cycle. Chu Hsi,[11] in ascribing the varying fortunes of individuals during their life to differences of endowment of Ether (p. 217) betrays a knowledge of the cyclical changes pertaining to body and mind, as well as to the outer world at large.

§ 113. It would be fallacious to argue from this that skilful prognostication of this kind would render medical treatment superfluous. The value of realizing these phases lies in the understanding with which measures are applied in order to tide over the patient during the dangerous period of inertia of vitality, breath, or other factors.

This would not dispense with the constant sense of "fiat voluntas Tua," both on the part of the lay and of the profession.

Quotations from the Chinese, for instance, in whom the conception or belief in Fate is vivid and almost dominant, brings no conviction to those many who claim to have no belief in Fate whatever. Nevertheless a few proverbs may be quoted, as expressing the conception usefully: "there is a day to be born, and a time to die"; "before life has been, death has been appointed." "In the beginning it was decided whether one should have long or short life; whether one should have honour or poverty." "The swallow living in the hall does not know the great building is about to be burned." "A physician may cure disease, but he cannot heal Fate." "The lucky physician sees the patient at the end of the disease; the unlucky physician sees the patient at the beginning of the disease." (Plopper,[76], chap. xi.)

No doubt where a possibility of "destiny" is to be admitted for one form of circumstance, the application of the same principle to many details of human life is not so readily conceded. That it is allowable for much more than is customarily accepted will be credible when the existence of occult and inscrutable chains of causes or attractions operating together is realized.

Fate is supposed by some to be blind; by others to be the decree of a far-off Potentate. It is neither. It is the manifestation of a series of combinations of conditions which by "natural" courses of sequences operate in the individual human life. Everyone shares in the weaving of his own web. The web is a by-product in some great scheme which we need not question. Fate ceases to signify for such as rise into the Scheme itself. For, to them, their life is as the throwing of the stone unerringly into the bull's-eye; the intervening events, the débris, what of them?

§ 114. Rather than criticize severely the idea of the length of individual human lives being preordained, Anwari[25] rightly asks (p. 54)

> "If destiny be not the arbiter of mundane affairs,
> Wherefore are men's states contrary to their wishes?"

"Who, then can say, 'I am an individual, independent and free. I can think what I wish, and I can do what I wish'? You are not doing what you wish . . . thinking what you wish! There are various thoughts around you in the form of men and animals, who influence your mind and feeling and thought; you cannot escape them. . . . There is always some person stronger than you and always someone weaker than yourself. . . . Our lives are tied together and there is a link in which we can see one current running through all." Rosegarden,[38] 1st ed., p. 52.

§ 115. No doubt "destiny" is often supposed to negative "freewill," which is so much insisted on as man's prerogative. Destiny belongs to the body, freewill to the soul. Or, to be more accurate, it is our Will which is important and not the body, or its length of life. Or, to be still more accurate, by employing the algebraic symbols already fixed on—we are born MF; from that moment, with each further reception of (feeding on) sights and sounds or other sense-impressions, we become MF'. But the purpose of human life has been shown to rise quite beyond this, and our goal is to become MF'' before we die. In each case M goes into corruption, but the position of F' and F'' is vastly different.

"The voices of Nature are the mother of the soul." F'' is the outcome of a consistent usage of "freewill" by the Will in a certain direction—namely supernatural, combined also with a "feeding" (to use the same term as above) on supernatural impressions.

To quote from theology, in which domain we are brought, "supernatural" does not refer to superstitions, evil practices, and hypothetical experiences; it is a term used in the sense of "supernatural grace." The ordinary human being is body plus rational soul in the natural order; but it has been intended that he shall be body plus rational soul in the natural order plus soul in the supernatural order (Irenaeus). "There should be no clash between the natural order and the supernatural, for both own God for their Author, and one great function of grace is to supernaturalize the natural life of man by the love of Christ." (O. R. Vassall-Phillips, C.SS.R.,[96] p. 31, 32.) Wherein lies the importance for a proper attitude by the physician towards his patient, in regard to the serious moments of life (among others), when deceit, equivocation, and concealment of the gravity of the malady are to be deprecated.

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62. To sum up, the equable temperament of the period of juvenility and youth is "hot," whereas that of the last two periods of life is "cold." The body in juvenility is additionally of a moist (equable) temperament, in that growth is proceeding; the moistness is shown by the softness of their bones, nerves and other members, and by the fact that at this age it is not going to be long before the semen and ether will come to manifestation. Old persons and those in the "decrepit" age are not only colder but drier in temperament. This is evidenced by the hardness of their bones, the roughness of their skin, and the long time which has elapsed since they produced semen, blood, and the vaporal (ether) breath.

The *fiery quality* is in equipoise during juvenility and youth, but the *airy* and *aqueous* quality is more abundant in juveniles. In old persons and in the decrepit, the *earthy* element is more predominant than in the other ages. This element is most marked during the decrepit age.

"Earth says to the earth of the body: return to thy root." (Mesnavi, [57] p. 162).

The temperament of youth is nearer to equipoise than that of juveniles, but, compared with them, its temperament is dry; compared with the third and fourth periods of life, the temperament of youth is moist.

The temperament of the decrepit period is drier than in youth and that of the third period of life in regard to the single members, but more moist than either in regard to extraneous moisture.

63. TEMPERAMENT IN RELATION TO SEX.

The female is of colder temperament; that is why the female is smaller than the male. The female is also moister. The coldness of temperament, as well as the habit of staying at home and taking so little exercise, accounts for the accumulation of excrementitious matters in the female. Their "flesh" is more fine in "substance" (texture) than that of the male, though the flesh of the male is more rarefied in virtue of that which is admixed with it. The denseness of male flesh renders permeation through its veins and nerves more difficult.

64. TEMPERAMENT IN REGARD TO GEOGRAPHICAL POSITION.—The temperament is moister in the peoples inhabiting northerly countries, colder in those living in southerly countries.

65. TEMPERAMENT IN REGARD TO OCCUPATION.—The temperament is moister in those who follow a maritime occupation; others are contrary.

66. THE SIGNS OF THE TEMPERAMENTS are discussed under the general and special signs and symptoms.

THESIS IV. THE HUMOURS

HUMOURS : *Fluids of the body.* § 116. The word "humour" does not now bear the sense which formerly made it an exact equivalent of *humor*. In German, "Saft" would still apply, but "juice" is unsuitable for the present translation. The term "fluids of the body" has been selected though requiring some qualification. Thus, the humour named "sanguineous" (**72**), or, simply, "blood," is not to be regarded as identical with the fluid drawn, say by venesection, and studied before or after clotting. The *phlegma* is not properly represented by either "phlegm," "mucus," or "lymph," though having some resemblances to each. "Serous humour" has been preferred to the older "phlegmatic humour." Similarly, "yellow bile" in the Canon may not be restricted to the fluid in a normal gall-bladder ; and "black bile" cannot be made synonymous with (black) pathological gall-bladder contents.

Furthermore, it should be said that the "humours" are quasi-material. In many passages of the Canon it would seem that when "matter" is spoken of, in connection with disease, "humour" is often meant, and particularly a morbid humour. But it is also clear that behind the humour there is what Paracelsus would call an "essence," or "radical humour," which itself governs the nature of the humour and whether or not it is going to become morbid. On such a view health depends on the maintenance of the essential humour in a state of purity.

Again, we may say that the blood is the "salt principle" of the body, the serous humour the "sweet principle," the bilious humour the "bitter principle," and the atrabilious humour the "sour principle" of the body. According as one or other of these is predominant in a person, so is his constitution or temperament. In addition to this, the view of the nature of a humour may be extended by suggesting, for instance, that fatty acid is an essential of choleric humour, whereas neutral fat is an essential of sanguineous humour ; that sulpho-centric substances are an essential of atrabilious humour.

§ 117. The idea belonging to the doctrine of the humours is not affected by biochemistry or cytology, any more than the theory of "four elements" is really affected by modern chemistry. To retain the idea is to claim a practical value in drawing a distinction between "humours" and the body-fluids. In **101** Avicenna speaks of the blood as a product of the liver, the material for its manufacture being derived almost directly from the food itself. As to the blood-cells, had he known of them he might justly still regard them as incidentals; as forces accresced for a time, and always changing in substance. After all, they are importations into the blood; whatever tissue be their real source, whether their origin is local or widespread, they are not the real trouble in anæmia. Remedies will increase their numbers, but do not touch the real disorder. From Avicenna's point of view, it might be said that the glamour of the revelations of the microscope has only diverted attention from the *real* "sanguineous humour" and its ultimate sources and similar subtleties, thereby leading treatment away to "attacks" on the red and white cell forming organs. For the blood is itself living—not a mere chemical conglomerate. Hence in this field there is a need for reverting to the old paths. The constant endeavour also to reduce everything to terms of cellular individualities, as opposed to one single complex—the human being, the one single *MF*—inevitably carries errors in its train.

When S. Thomas wrote "Health is a harmony of the humours" (*Sanitas est quaedam harmonia humorum*) [81-82] (ii. 64, p. 166) he was so near the truth as to maintain his place even in these days of excessively refined details of knowledge.

I.—WHAT A BODY-FLUID (HUMOUR: AKHLAT) IS, AND HOW MANY KINDS THERE ARE.

67. A body-fluid, or "humour" is that fluid moist "body" into which our aliment is transformed.

Healthy, or "good" humour (whether present in the aliment in a pure state or admixed) is such as has the capacity for becoming transformed into actual body-substance, either by itself or in combination with something else. In short, it is that which replaces the loss which the body substance (continually) undergoes.

From the above definition, it is clear that "body-fluid" is not synonymous with "humour." Urine, too, though a fluid, is not a humour.—In a sense, body-fluids are the meeting-places between various opposed forces or elements, and their chemical composition is the mode in which such forces or elements are expressed. In this sense, the term body-fluid does not conform to the wording of the above paragraph.

68. The residue from such, the "superfluity," is called unhealthy or "bad" humour. This is contrary in capacity to the former, and is only exceptionally convertible into good humour. It is proper that it should be expelled from the body instead.

The familiar phrases "good-humoured," "bad-humoured" of modern conversation may not have the same significance to the speakers as they had in Shakespeare's day, but retain their value.

69. Some of the fluids are primary; some are secondary.

The *primary* fluids of the body are: the sanguineous humour, the serous humour, the bilious humour, and the atrabilious humour.

The *secondary* fluids of the body are:—

(*a*) *non-excrementitious*:

i. located at the orifices of the minutest channels near the tissues, and thus irrigating them.

ii. permeating the tissues like a dew and capable of being transformed into nutriment as required.

iii. an almost congealed fluid.

iv. a fluid existent among the tissue-elements from birth.

(*b*) *excrementitious*. "Superfluity." Forms of the respective primary fluids.

70. As regards the non-excrementitious fluids, these have not yet been subjected to the action of any of the simple members; not till they reach the tissues for which they are destined, are they changed. (*p*).

Of the four varieties above named, the second moistens the tissues according to the requirements which active movements entail, and it comes into play if there is anything likely to dry up the tissues. The third variety forms a nutriment which will be changed into the substance of the tissues, whether to the extent of entering into their temperament, or to the extent of changing into their very essence, thereby attaining an entire likeness to the member. The fourth type accounts for the continuous identity of the member or of the body throughout life; it arose with the sperma. It is however true to say also that the semen (both male and female) arises out of the humours.

71. The Four Body-Fluids or Humours Proper.

1. The sanguineous humour, the most excellent of all.
2. The serous humour.
3. The bilious humour (lit. "red bile").
4. The atrabilious humour (lit. "black bile").

72. The Sanguineous Humour.

In nature (that is, considered dynamically) the blood is hot and moist. In character it either conforms to its nature or it does not. That is (we may say) it is "normal" or "abnormal."

Normal " blood " is red in colour, has no unpleasant odour, and has a very sweet taste.

When blood is *abnormal*, it is either (*a*) because the good temperament has become intrinsically altered or vitiated—i.e. has become colder or hotter ; but not from admixture with any foreign matter, or (*b*) because an unhealthy body-fluid is admixed with it. This may happen (i) by an unhealthy fluid coming to it from without, penetrating it and so causing decomposition in it, or (ii) by a putrescent change in a portion of itself—the rarefied product becoming bilious humour, and the denser product becoming atrabilious; either one, or both together, may remain in the blood. Abnormal blood of type (i) is named according to (*a*) that which is admixed with it—whether serous humour, or atrabilious, or simply bilious fluid. That of type (ii) is named according to (*b*) its colour and wateriness—sometimes it is turbid, sometimes attenuated, sometimes very dark from much blackness, sometimes pale, (*c*) taste and odour—bitter, salt, or sour.

§117*a* " Blut ist ein ganz besondrer Saft."

The blood may well be regarded as comprising : sanguineous humour, corpuscles, the canalicular system of the whole body, and the tissue-elements abutting thereon ; that is, as including the lymphatic channels and their floating cellular population. In addition, there are the blood-forming centres, which are the meeting-point of two vitalities—the livingness of the blood and the livingness of the tissues. The hæmopoietic centres are foci disseminating " vital force," as also are the endocrines, the abdominal ganglia, etc. The energies so well-known as chemical, physical, osmotic, etc., are not primary, but conversions from the living force of these centres. When the blood changes, or its cell-formula changes, it is because the vital force is changing its mode : instead of radiating in one way, it is disintegrating in other ways, and it involves some one organ more than usual. The balance of action on organs, and the balance in interchange now ceases to be " just," and the organ or organs concerned therein are then apt to receive the brunt of the physician's attention.

73. The Serous Humour.

In nature, this is cold and moist. We describe a normal form and an abnormal.

Normal (" sweet ") serous humour is such as is capable of transformation into blood at any time, seeing that it is in fact an imperfectly matured blood. It is a sort of " sweet "* fluid which is not in too cold a state; that is, it is cold compared with the blood and bilious humour, but hardly at all cold compared with the body as a whole. A "sweet" serous humour may change into one which is insipid, and abnormal, as we shall describe presently. This happens when there is normal blood admixed—as occurs often in catarrhal exudates or discharges, and saliva.

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* We may note that it is still correct to call a discharge " sweet."

Sweet serous humour (lymph) has no special locus or receptacle in the body, any more than the two bilious humours have. Yet the serous humour resembles blood closely in this that it is equally necessary for all tissues, who receive it along with the blood.

The tissues absolutely require serous humour for two reasons—one being essential, and the other accessory.

The *essential function* is two-fold: (*a*) that it should be near the tissue (cells) in case they should be deprived of their habitual nutriment (viz., healthy blood) by reason of retention of the material in the stomach or liver from some cause. This material is normally acted upon by the vegetative faculties, which change and digest it and are themselves maintained thereby. The transformation of lymph into blood is achieved by the innate heat. Alien heat would only putrefy the material and decompose it. This kind of relationship does not obtain in the case of the two bilious fluids, because neither of them turns into blood at any time, as the serous humour does, under the influence of the innate heat; but they resemble the serous humour in undergoing putrefaction and decomposition under the influence of "alien" heat.*

(*b*) it must be admixed with sanguineous humour before it can reach and nourish tissues of lymphatic temperament. When the serous humour is present in the blood for subserving nutrition, it must be in definite proportion before it reaches the parts to be nourished; e.g. the cerebrum. It is the same in the case of the two bilious humours.

The *accessory function* is that of moistening the joints and tissues and organs concerned in movement, for otherwise the heat of the friction of the movement would produce dryness of their surfaces. This function is within the range of necessity.

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* For "alien heat" we should now read "bacterial infection."

74. Table of Forms of Serous Humour.

i. Normal.

Sweet.

ii. Abnormal

A.—Arranged according to the Taste.

No.	Description.	Remarks.	Temperament.
1	Sweet.	(i) Outcome of action of the vegetative faculties ; (ii) Due to admixture with blood.	Hot and moist.
2	Salt.	Due to admixture with bile, " bilious serous humour."	Hot and dry.
3	Acid or Sour	(i) Intrinsic in origin ; (ii) due to admixture with acrid atrabilious humour.	Cold and dry.
4	Bitter	(i) From undue infrigidation ; (ii) from admixture with atrabilious humour.	
5	Insipid.	Attenuated serous humour.	Cold and moist

B.—Arranged according to Essential Nature.

No.	Description.	Remarks.
6	Watery.	Attenuated serous humour. This may be salty if there arise in it some sort of putrescence.
7	Excrementitious or Mucilaginous.	A superfluity of foreign nature, and evident as such to the senses as a mucilaginous material.
8	Crude.	This is a subvariety of the preceding ; to the senses it appears to be the same as the preceding, but actually is different.
9	Vitreous.	Glasslike in texture ; taste sometimes sour, sometimes absent.
10	Calcareous.	Opaque white. Denser than the " crude " form. The attenuated part has been dispersed ; that which is denser than all the others therefore lingers too long in the foramina and joints.

(This table is constructed out of the statements in the text in conjunction with the table devised by Joannitius[44]). The additional matter does not therefore follow the same order as the Latin text, though including all the information therein.)

The abnormal forms of serous humour (see also **74**).

75. *Salty serous humour* (No. 2 in table), is warmer, drier and lighter than any of the others. It is salty because oxidized earthy matters of dry temperament and bitter taste are admixed with the watery (nearly or quite insipid) "moisture," in equal proportions. I say "equal" (i.e. in potency, not weight. Tr.) because if the earths were in excess, the taste would be bitter rather than salt. The same sort of process accounts for the origin of the salts in all the salty waters found in Nature.

76. Salts may be obtained artificially also, by boiling ashes, soap ashes, or chalky matter, etc., in water. Then strain.

The salt will then separate out from the water, either at once, or on standing.

77. *Attenuated serous humour* (No. 5, 6) is similar. This may be insipid or have only a slightly salt taste. This taste results from the admixture with an equal amount of oxidized bile, which is dry and bitter; and the resultant heating salty fluid is called "bilious serous humour." Though Galen believed that this kind of serous humour owed its saltiness to admixture with putrescence or wateriness, my teaching is that the putrescence makes it salty by setting up oxidation in it, in consequence of which an "ash" becomes admixed with the moisture. Aquosity by itself is insufficient to render serous humour salty; some other factor must be present, either as well or on its own account.

78. Serous humour (No. 4) becomes *bitter* if (i) atrabilious humour (which is bitter) be admixed with it, or (ii) too much infrigidation takes place, whereby the taste changes from sweet to bitter.

The process consists in a congealing and degradation of the watery element into something dry, and therefore earthy in character. The degree of heat is too small to ferment it and make it sour. A strong heat would completely alter it (into something else altogether).

79. *Sour or acid* (No. 3). As in the case of sweet humour there are two forms—one where the sourness is intrinsic in origin; and one where it is introduced from without. In the second case it is acrid atrabilious humour that is the extraneous factor. We shall speak of it later. When the sourness is intrinsic, it is comparable with the change that takes place when the other juices go sour. In other words, it is sour because the humour has fermented and then gone sour.

80. No. 6. See under No. 2. (No. 7 and 8 are described in the table.)

81. The *vitreous* kind of serous humour (No. 9) is dense and closely textured, and resembles glass in viscosity and weight. It is sometimes sour to the taste and sometimes tasteless.

When a humour like this is closely textured and insipid, it either is "crude," or changes into a crude serous humour. The vitreous humour was originally a watery humour, and "cold"; and remained so without undergoing putrescence, or having any other thing admixed with it. All this time it is not manifest to the senses. It becomes evident only when it thickens in texture, and develops coldness.

3. THE BILIOUS HUMOUR.

In nature this is hot and dry. It also occurs in a normal and an abnormal form.

82. *Natural bilious humour* is the "foam" of blood. It is bright red in colour. It is light and pungent. The redder its colour, the hotter it is. It is formed in the liver, and then pursues one of two routes—either it circulates with the blood, or it passes on to the gall-bladder. The part which passes into the blood-stream subserves two *purposes*—(i) it enables the blood to nourish those certain tissues or organs which need the presence of a suitable amount of bilious humour in a dispersed form : as holds in the case of the lung. (ii) a mechanical one. It attenuates the blood (i.e., diminishes its surface tension !) and thus enables blood to traverse the very minutest channels of the body.

The part which passes to the gall-bladder subserves two purposes : (iii) the removal, in this form, of a certain portion of the effete matter of the body. In so doing it nourishes the walls of the gall-bladder.

(iv) a dual *function* (*a*) it cleanses the food-residues and viscous serous humour from off the walls of the bowel, (*b*) it stimulates the muscles of the (lower) intestine and anus, thereby enabling them to perceive when it is necessary to go to stool.

83. Any obstruction to the flow of bile from the gall-bladder through the duct into the intestine is liable to cause colic.

84. *Types of Bilious Humour.*

Group.	Variety.	No.	Description.	Site.	Origin.	Quality.
A	Normal.		Clear and pure	Liver ; blood	Foam of blood.	Hot.
B	Abnormal *by admixture* with alien substance.	1	Citron-yellow	Liver.	The alien substance is attenuated serous humour (added to A).	Less hot.
		2	Vitelline-yellow, colour of egg yolk.	Liver.	Dense (coagulated) serous humour added to A.	Less hot.
		3	Oxidised bile, type b. It is ruddy-yellow, not transparent, resembles blood, but is tenuous. Various other colours may appear in it.	Liver ; blood	Simple admixture with *atrabilious* humour.	Less deleterious than 4
		4	Oxidised bile, type a.	Gallbladder.	Spontaneous Oxidation of bile = attenuated part + ash. But this ash does not separate out.	More deleterious than 3.

Group.	Variety.	No.	Description.	Site.	Origin.	Quality.
C	Abnormal *by internal change* of substance.	5	Hepatic form.	Liver.	*Oxidation* of attenuated part of *blood.* The denser part of the blood separates out as atrabilious humour.	Mod. toxic.
		6	Leekgreen bile. Gastric type a	Stomach.	*Oxidation* of vitelline *bile.*	Less toxic.
		7	Mildew or verdigris green bile. Gastric type b	Stomach.	Intense degree of *oxidation* of vitelline *bile* till all moisture is lost.	v. hot, extremely toxic.

No. 7 is possibly derived from No. 6 by an increase in the degree of oxidation, whereby all the moisture is dried up. The fact of becoming too dry accounts for the whitish colour. For we know that when heat is applied to a moist substance, it first turns black, until all the moisture has vanished, and after that the blackness changes into whiteness. When the moisture is less than half and half, whiteness begins to be visible. Thus, wood is first charred and finally becomes a white ash. Heat applied to a moist body makes it black ; applied to a dry body it makes it white. Cold applied to a moist body makes it white, and applied to a dry body makes it black. Such is our opinion about the leekgreen and verdigris-green biles.

Verdigris-green form of bile is both hotter and more depraved, and more deadly than all other kinds of bile. It must therefore be classed as one of the toxic substances.

4. THE ATRABILIOUS HUMOUR.

85. This is cold and dry in nature. There is a natural or normal form of this effete substance, and also an abnormal or morbid form.

86. The *normal* form is the " faex ", or sediment of good blood, an effete matter. In taste it is between sweetness and bitterness. It arises in the liver and then divides into two portions, one of which enters the blood, and the other goes to the spleen.

87. The portion which enters into the blood subserves two *purposes.* (*a*) It takes parts in the nourishment of those members which need a trace of atrabilious humour to complete their temperament. Ex.: the bones. (*b*) It bestows stamina, strength and density and consistence upon the blood.

88. The portion which passes to the spleen is such as is no longer of any use to the blood. Its *primary use* as regards the body as a whole is that it clears the body of so much effete matter. Its use in regard to one special organ is that it supplies nourishment to the spleen. Its *secondary* use is that by travelling to the mouth of the stomach by a sort of milking movement, (*a*) it gives it tone and makes it tighten up and thicken, (*b*) its bitterness irritates (tickles) the mouth of the stomach and sets up a sense of hunger and so arouses the appetite.

89. You must remember that the part of the bilious humour which passes to the gall-bladder is something no longer needed by the blood, and that the part which emerges from the gall-bladder is something no longer needed by that either. It is much the same with the atrabilious humour. That part which goes to the spleen is such as is no longer needed by the blood, and that part which emerges from the spleen is such as is no longer needed by the spleen.

And besides that, just as the bilious humour, in passing through the intestine, arouses peristalsis and so helps to get food away from the stomach, so the atrabilious humour passing from the spleen arouses appetite and leads to the drawing in of food down into the stomach.

Wherefore thanks be to Allah the best Artificer of all things, and unending the praise.

90. The *abnormal form* of atrabilious humour is not a sort of precipitate or "faex"; it is really a form of oxidized material, or ash formed from an oxidation of the commingled bilious humour. Thus, when moist things are admixed with earthy ones, the earthiness separates out (1) as a sediment. This is exemplified in the case of the blood, of which normal atrabilious humour is a sediment. (2) as an ash, or oxidation-product. In this case the rarefied portion disperses and the dense portion remains behind. This is exemplified in the humours, of which excrementitious atrabilious humour is the segregate.

91. Blood is the only body-fluid which yields a precipitate of this kind. Serous humour does not do so because of its viscosity; it behaves like oil. Bilious humour does not do so because it is attenuated and is deficient in earthy matters, and it is also constantly moving. This is because the blood separates out only very little; nothing which needs attention; besides, if a substance should separate out, it would soon putrefy or be expelled from the body. If it putrefied, the attenuated part would disperse, and the denser part remain behind. It is this denser unprecipitated part that is the oxidized atrabilious humour.

The abnormal atrabilious humour is hotter and lighter than the natural form, and it has in itself a strong penetrative power of moving from the upper parts to the lower, and also a destructive action (Joannitius).

92. *Excrementitious atrabilious humour* is of four kinds: (*a*) the ash derived from bilious humour. This is bitter. The difference between this and oxidized bilious humour is that in the latter the ash is only admixed, whereas in the other the ash separates out after dispersal of the attenuated portion; (*b*) the ash derived from the oxidation of serous humour. The ash becomes salty if the serous humour is too attenuated and watery; otherwise the ash is acid or bitter; (*c*) the ash derived from the oxidation of sanguineous humour. This is salty and faintly sweet; (*d*) the ash derived from normal atrabilious humour. If this humour be attenuated, the ash will be very acrid, like vinegar. That is, when vinegar (and the like) is sprinkled upon the earth it "boils" and acquires an acrid odour, so that flies and insects of all kinds shun it. If the atrabilious humour were dense the ash will have less acrimony and be only slightly bitter.

93. There are three *kinds of morbid atrabilious humour*:—(1) Oxidised bilious humour, whereby the attenuated portion is removed. There are two varieties of this.

94. *Injurious Actions.* (2) *Sero-atrabilious humour* is less injurious and acts at a slow rate. (3) *Choleric-atrabilious* humour is more injurious, and undergoes decomposition very readily. (*a*) This form is more amenable to treatment than the other. (*b*) There is another form which is more acrid, and more injurious. Still, if treatment be begun more early, it will be more quickly amenable thereto. (*c*) A third form effervesces less when dropped upon earth and penetrates the tissues less easily, and is more slowly destructive. On the other hand it is very difficult to disperse, or mature or treat by any remedial measures.

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These then are the several kinds of normal and excrementitious humours.

. . . . . .

95. Galen regards the blood as the only normal body-fluid, for he considers that all others are excrementitious and quite useless. But if the blood were the only nourisher of the various organs of the body, it would be as much as saying they are all alike in temperament and nature. Bone would not be harder than flesh were it not for the hardness in the atrabilious humour present in the blood. Brain would not be softer than the flesh were it not for the presence in the blood of the soft serous humour which nourishes the brain. So we conclude that in the blood there are other humours, which leave it (in the various organs).

96. Moreover, we see how when blood is withdrawn into a vessel, it contracts and allows various portions visibly to separate out—a foam (the yellow bile), a turbid faex (the atrabilious humour), a part like egg-white (the serous humour), and a watery part (the aquosity), which passes out through the urine. One does not count the aquosity among the body-fluids because it is not a nutrient, even though it is true it is taken in as drink. Its purpose is to dilute the aliment and enable it to permeate the tissues. A humour, on the other hand, is a nutrient, derived from both food and drink. By the word " nutrient," I mean that which is assimilable into the likeness of the human body—a complex substance, and not a " simple " body. Water, of course, is a " simple " body.

* * *

97. Some think that strength of body depends on abundance of blood ; that weakness is associated with paucity of blood. But it is not so. It is rather this, that the state of the body determines whether the nutriment will be beneficial to it or not.

Others again, believe that whether the humours be increased or lessened in amount, the maintenance of health depends on the preservation of a certain quantitative proportion between the several humours, one to another, peculiar to the human body. But that is not exactly correct. The humours must, besides that, maintain a certain constant quantity. It is not a matter of the composition of one or other humour, but of (the body) itself ; but the proportions which they bear one to another must also be preserved.

98. I purposely omit referring to certain other problems relative to the humours, because they pertain to philosophy and not to medicine.

Tentatively to draw up correlations between modern biochemical data and the humours as above described would not be quite a useless exercise. From the description, it is clear that any given sample of blood contains : (1) all four normal humours; (2) a certain proportion of immature humours—that is, under-oxidised digestive products; (3) excrementitious humours—the tissue-wastes or effete substances; the by-products of complete oxidation. In diseased states, it may also contain (4) certain depraved humours, including (*a*) over-oxidised products; (*b*) putrefactive substances of various kinds.

To (1) belong: as regards the sanguineous humour—serum-globulins and serum-albumen, neutral fat, glucose, and the salts concerned in maintaining the acid-base equilibrium; as regards the bilious humour: bile-pigments, cholesterin, and perhaps lecithin and volatile fatty acids; to atrabilious humour: neutral sulphur, nitrogen compounds when in colloidal form, certain mucoids.

To (2) belong: glycogen, animal gum, soaps, various salts. To (3): the non-protein-nitrogen group (urea, ammonia, creatinin, etc.) To (4): the products of bacterial growth, various auto-intoxications, diamines, etc.

To complete the correlations, some idea should be formed as to the morphological place to which the substances are severally to be assigned, as doubtless the humours occupy blood-corpuscles and other particulate components of the blood.

2. The Mode of Origin of the Fluids of the Body.

99. Aliment undergoes a certain amount of digestion during the act of mastication. The lining of the mouth being continuous with that of the stomach, there is as it were one continuous digestive surface. When that which has been masticated comes in contact with it, a certain change at once takes place in it—namely under the influence of the saliva, whose action, in virtue of the innate heat within it, is digestive. That is how it is that when wheat is masticated it procures the maturation of furuncles and abscesses, but has no such effect when simply rubbed with water, or even if boiled with water.

Some assert that the sign which shows us that food is already beginning to be altered after mastication is that prior to this act there is neither odour nor taste in it.

100. Once the aliment has entered the stomach, true digestion goes on—not so much by reason of the heat of the stomach as by reason of the heat of the enveloping members—namely:

On the *right:* the liver.
On the *left:* the spleen. This not warm in virtue of its own substance, but in virtue of its blood-supply.
In front: the omentum, whose fat easily retains heat and reflects it on to the stomach.
Above: the heart, which warms the diaphragm and so warms the stomach.

101. The *first stage of digestion* yields the essence of the aliment, which, in many animals, becomes "chyle" by the help of admixture with the fluid which one has consumed. The chyle is of the consistence of a ptisan (broth), that is, as thick as sodden barley.

102. The portion of this chyle which is thus diluted is drawn from the stomach into the intestines, and then is caused to enter into the roots of the mesenteric vessels which are found all along the intestinal tract. These vessels are slender, and firm. Having entered these channels the nutriment passes into the portal vein, enters the gateway of the liver, and then travels along finer and ever finer divisions until it comes to the capillaries (lit., the very fine hair-like channels), which are the ultimate sourse of the vena cava emerging from the convexity of the liver.

The passage of the nutriment through these very narrow channels could not take place were it not admixed with water consumed in excess of the strict requirements of the body.

By being distributed over the whole liver in this way, the chyle is exposed to the digestive function of the whole organ, and the function of the liver is thus accomplished most vigorously, energetically, and speedily. The change of nutriment into blood is now complete.

103. The various products and by-products of digestion up to this point may be tabulated as follows (*p*) :

TABLE OF DIGESTIVE-PRODUCTS.

(*a*) In *healthy digestion*—	
(i) the blood itself.	
(ii) By-products :	
(*a*) a foam	the bilious humour.
(*b*) a sort of precipitate	the atrabilious humour.
(*b*) In *unhealthy digestion*—	
(iii) By-products :	
(*c*) An oxidation product, where digestion is carried too far :	
1. Attenuated portion	morbid bilious humour.
2. Dense portion	morbid atrabilious humour.
(*d*) A product when digestion is not carried far enough	serous humour.

104. As long as it stays in the liver, the blood which the liver forms is more attenuated than it should be, because the wateriness is in excess, for the reason already given. But when the blood leaves the liver the excess of water is removed, for it is taken to the renal vessels, and so provides the kidneys with the quantity and quality of the blood best suited for their nutrition. The " fat " of the blood nourishes the kidneys, and the superfluous wateriness and a certain degree of sanguineous material passes down to the bladder and so away from the body.

105. The good blood ascends into the superior vena cava, and its subsequent course is into smaller and smaller veins : and finally into the finest hair-like channels. Having reached these hair-like channels it " sweats out " through their orifices and bathes the tissues, according to the decree of Allah.

106. Table of the Causes of Humours.

Name of Cause.	Blood.	Bilious Humour	Serous Humour.	Atrabilious Humour.
Material Cause.	Those parts of the solid and fluid aliment which are of equable temperament.	The attenuated hot, sweet, oily and sharp by-product of aliment.	The dense humid, viscid, cold by-product of the aliments.	The very dense by-product of the aliments, very deficient in moisture, and exceeding in heat.
Formal Cause.	Exact and good digestion.	Digestion verging on excess.	Imperfect digestion.	Precipitative tendency, preventing the flow or dispersal.
Efficient Cause.	Attempered heat.	Attempered heat, for normal bilious humour (' foam '). Undue heat, for abnormal bilious humour. Site: liver	Feeble heat.	Medium heat; i.e., a heat of oxidation which surpasses the limits of equipoise.
Final Cause.	To nourish the body.	Primary: nutrition; attenuation of blood. Secondary: cleansing bowel wall; desire for stool (see **82**).	Primary and Secondary purposes named in **73**.	Primary and secondary purposes named in **87**. Nutrition. Inspissation of blood. Nourishment of spleen. Tone to stomach. Aid to appetite.

107. Further details regarding the efficient causes :

I. *Action of heat and cold.* One must not forget that the most fundamental agents in the formation of the humours are heat and cold. When the heat is equable, blood forms ; when heat is in excess, bilious humour forms; when in great excess, so that oxidation occurs, atrabilious humour forms. When the cold is equable, serous humour forms ; when cold is in excess, so that congelation becomes dominant, atrabilious humour forms.

II. *The faculties.* There is also a proportionate relation between the active and passive faculties (which has to be considered in thinking of the formation of the humours).

III. *The temperaments.* One must not get the idea that every temperament gives rise to its like and never to its opposite. A temperament often gives rise to its exact opposite, indirectly (of course); it cannot do so directly. A cold and dry temperament may give rise to visible moisture, though this would not be beneficial, but would indicate that the digestion is feeble. A person with such a temperament would be thin, with supple joints, and hairless skin, cold to the touch, the surface veins narrow, and he would be gentle and apprehensive (timid) in nature. He would be like the old person, who makes too much serous humour and is cold and dry in temperament.

108. *Circumstances which make the atrabilious humour plentiful.*

(1) Immoderate degree of heat in the liver.

(2) Weakness of the spleen.

(3) A degree of cold sufficient to be congelative and cause marked and long-continued constriction.

(4) The existence of various long-standing or often repeated diseases whereby the humours are reduced to ash.

When the atrabilious humour is plentiful, it lodges (not literally, but virtually) between the liver and stomach, with the result that the formation of blood and healthy fluids is interfered with, and less blood is formed.

* * *

109. *Third digestion.*—The blood and that which circulates with it undergoes a third digestion in the blood-vessels.

This is a truth worth noting. The tissue-foods carried by the blood, and the tissue wastes discharged into it, undergo treatment within it, which is only efficient if certain salts and acid bases are present; otherwise conversion of such substances into available form fails to occur; and deposition in various tissues, fasciæ, and joints, and even in the vessel-walls (atheroma, e.g.) and nerve-sheaths occur with ill effect. These deleterious substances may be thought of as composed of particles too large to permeate the ("invisible") pores of the tissue-boundaries referred to, and the pathological condition of "obstructions" which looms so largely in the Canon here finds its *raison d'être.*

110. *Fourth digestion.* When the nutriment has reached the various members, giving each its appropriate "element," a *fourth* digestion takes place.

111. *The fate of the residues.* The residues from the first digestion (namely that in the stomach)—pass out by way of the intestines as excrement. Those from the second digestion (namely, in the liver)—pass out chiefly by the urine, though some go to the spleen and gall-bladder. The residues from the other two digestions are discharged partly by the skin as insensible perspiration and external sordes; partly through visible orifices—the nostrils and ears; partly through the invisible orifices scattered over the whole body; sometimes through unnatural channels in the form of inflammatory matter ; sometimes as appendages like the hair and nails.

If the body-fluids become attenuated, they are readily dispersed and discharged from the body, especially when the pores dilate. The loss of such fluids produces great weakness, not only by the fact of the loss but also by the dispersion and loss of *breath* which (necessarily) occurs simultaneously.

112. Lastly, it must be clearly understood that not only the causes of origin, but also the causes of movement of the humours must be taken into consideration.

Exercise and heating agents set in motion the sanguineous humour, the bilious humour, and even the atrabilious humour (which is strengthened thereby). Repose sets the serous humour in motion and strengthens it. Repose also strengthens some kinds of atrabilious humour.

Even imagination, emotional states and other agents cause the humours to move. Thus, if one were to gaze intently at something red, one would cause the sanguineous humour to move. That is why one must not let a person suffering from nose-bleeding see things of a brilliant red colour.

"Anger, joy, and passions of a like nature are accompanied by a change in the body." (Sum. Theol. 75, 3 ; p. 11, trans.)

The temper of a cow frequently determines the quantity of the milk it yields, if it gives milk at all. But under the influence of such passions as anger, rage, fury, the milk changes in quality, and develops noxious or poisonous properties. Even the flesh may become poisonous if the animal suffered intensely or protractedly, either mentally or physically. Overdriven cattle may thus yield meat which contains toxic substances injurious to the human consumer (Lindasy,[48] ii. 270, etc.).

Effects of colours on bodily functions.—Red and yellow are injurious to the eye. Blue light soothes the movement of the blood, while red light stimulates it. Morning light aids nutrition. Colours vary in their effect according to their intensity. Conversely, darkness benefits various conditions ; it helps to induce inactivity and sleep (Pereira[152] ; Babbit [151]).

Light in another sense has an effect on the emotions : for instance, the light of intelligence converts fear (earth element) into caution, affection (water element) into benevolence.

113. This completes all we propose to say at present about the humours and their mode of formation. There are other aspects of the subject whose discussion and justification pertain to the philosopher.

(See also the composite Chart at the end of the Volume.)

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ANATOMY
實事

THESIS V. THE MEMBERS

1. WHAT A MEMBER IS AND WHAT ARE ITS COMPONENTS

114. The members of the body are derived primarily from the commingling of the humours, just as the humours are derived primarily from the commingling of the aliments, and the aliments are primarily composed of commingled " elements."

115. There are simple members and compound members. The simple members are those whose structure is homogeneous throughout, so that their name describes them in all parts : e.g. flesh, bone, nerves, and the like.* The compound members are those in which one and the same word is not a correct description of all the parts. For instance, in the case of " hand," " face," —a part of the face is not " face " ; a part of the hand is not " hand." These members are called " instrumental " because they are the instruments whereby the passions and actions of the mind (" soul ") are achieved.

TABLE OF THE MEMBERS.

AUXILIARY ORGAN *Afferent*	SENSE ORGANS	LUNG	STOMACH AND INTESTINE	CONSTITUENTS OF HUMOURS
	↓ Attractive faculty	↓	↓ VEINS ↓	↓
PRINCIPAL ORGAN	BRAIN (Animal breath)	HEART (Vital breath)	LIVER (Natural breath)	REPRODUCTIVE GLAND
	↓	↓	↓ expulsive faculty	↓
IMMEDIATE AUXILIARY ORGAN *Efferent*	NERVES	ARTERIES	GALL-BLADDER, SPLEEN, KIDNEY	DUCTS AND GENITAL ADNEXA
	↓	↓	↓ expulsive faculty	
REMOTE AUXILIARY ORGAN (Elementary Tissues)	BONES, CARTILAGES, LIGAMENTS, MUSCLES, FASCIAE, TENDONS, MEMBRANES	" FLESH " FAT	INTESTINAL TRACT	

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* Equivalent to the modern term *Elementary tissues.* Cf. " homoiomenous " parts.

116. The Simple Members (the "elementary tissues.")

"Simple": Cf. the scholastic sense—homogeneous; indivisible. (See § **19**.)

1. The *bone*. This is sufficiently hard to form the foundation of the body as a whole, and provide the purchase needed for its movements.

2. The *cartilage*. Being softer than bone, this can be bent, and yet it is harder than all the other members. It was made for the purpose of providing a cushion between the hard bone and the soft members, so that the latter should not be injured when exposed to a blow or fall, or compression. This is shown in the case of the shoulder-blade and the bones over the praecordia, and the ribs; and in the case of the epiglottis and xiphisternum. In the case of joints, it prevents the tissues from being torn by the hard bone. It gives a purchase for a muscle to obtain extension in places where there is no bone to give attachment or support (for instance the muscles of the eyelids), and also gives attachment to muscles without being too hard for them (for instance, the epiglottis).

3. The *nerves*. These are structures arising from the brain or spinal cord. They are white, soft, pliant, difficult to tear, and were created to subserve (*a*) sensation, (*b*) movement of the limbs.

4. The *tendons*. These form the terminations of the muscles. They resemble nerves in appearance. They are attached to movable members, and when the muscles contract and relax, the parts to which the tendons are attached move to and fro. They may sometimes broaden when the muscle expands, and then become narrow again on their own account, lengthening and shortening apart from the lengthening and shortening of the muscle. Sometimes this is through the intervention of ligaments. The upper part of the muscle is called "flesh"; that which leaves the flesh and passes to the joint, bringing the two close together, is the "tendon."

5. The *ligaments*. These structures have the appearance and feel of nerves. They are of two kinds: true and false. The latter extends to the muscle. The former does not reach as far as the muscle, but simply joins the two ends of the bones of a joint firmly together. This false ligament has not the feel of ligament, and is not painful when moved or rubbed. The auxiliaries of the ligaments are the structures attached to them, as has been explained.

6. The *arteries*. These structures arise from the heart. They are hollow, elongated, fibrous, and of ligamentous consistence. Their movements consist in expansion and contraction, which distinguishes them from the veins. They were created in order to enable the heart to be ventilated, fuliginous vapour to be expelled therefrom, and the breath* distributed by their means to all parts of the body.

7. The *veins*. These resemble arteries except in so far as they arise from the liver and do not pulsate. Their purpose is to carry the blood away from all parts of the body.

(As the text stands, it will equally read " to all parts of the body." As we know, the belief was that blood left the heart to all parts of the body, and also left through the veins to all parts of the body. The arteries carried the breath. The veins carried the aliment. The heart therefore drove blood away from it on both sides. The distribution into minute capillaries was known for both series of vessels. But it did not seem to occur that the two flows were in opposite directions, and *that as much went out of the heart as came into it*. The conviction that the two quantities were *not* equal was the real reason for not going on to the truth of the literal circulation. At bottom, it was the equality of the two quantities which Harvey had to prove in order to establish the fact of the circulation.)

8. The *membranes*. These structures are formed of extremely minute interwoven filaments which are extremely delicate. Their object is (*a*) to form the external covering for other structures and thereby (*b*) preserve the form and outline of these structures, (*c*) to support the members, (*d*) by means of their fibres to bind together the nerves and ligaments with the members ; for instance they hold the kidneys in position, (*e*) to impart sensation to members which are themselves insensitive, since by providing a sensitive covering they enable the member to be aware of anything befalling it. For instance : the lung, the liver, the spleen, the kidney ; all of which are in themselves insensitive, and would not feel being touched were there not a membrane over them.† A flatulent distension or an inflammatory deposit in the organ is felt by us only because the enclosing membrane, being stretched, feels it ; or, in the case of an inflammatory mass, is aware of the weight.

9. The *flesh*. " Flesh " includes muscles, fasciae, tendons, ligaments, connective-tissues, and so forth all together. Flesh is that which fills up the spaces left within the members, thus imparting firmness and solidity.

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117. In every member there is a natural faculty (the vegetative faculty) which subserves its own nutrition. This faculty is the power by which attraction, retention, assimilation, union with nutriment, and expulsion of effete matter are secured. Members may therefore be classified accordingly. But besides that, some members possess a further faculty which passes from them to another member, while others have not such a faculty. Other members again have still another faculty which passes into them from another member, and some have not such another faculty.

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* Nowadays we would say " oxygen " instead of " breath."

† We know to-day that the viscera are only sensitive to touch and pain via their peritoneal covering (Tr.).

The following associations may therefore be assumed :—

(*a*) receiving and also giving a faculty.
(*b*) giving and not receiving a faculty.
(*c*) receiving and not giving a faculty.
(*d*) neither giving nor receiving a faculty.

118. There can be no doubt about the existence of the first-named. All agree that the brain and the liver each receive their power of life, natural heat, and breath from the heart, and that each of them is also the starting-point of another faculty which it sends out to other organs. But there is a disagreement about the second. Thus in the relation between the brain and sensation, is sensation confined to the (literal) brain, or not ? In the relation between the faculty of nutrition and the liver, is it integral in the liver, or not ?

119. Then, too, in regard to the heart. There is a great disagreement between the philosophers and the physicians. The great Philosopher said that the heart is a member which gives and does not receive ; that it is the first root of all the faculties and gives the faculties of nutrition, life, apprehension, movement, to the several other members,—whereas physicians (and some of the ancients) considered these faculties to be distributed among several members (the faculty of nutrition in the liver ; of vital power in the heart ; the mental faculties in the brain) ; and that hence there can be no such thing as a member giving without receiving. However plausible the physicians are, careful consideration shows that the argument of the Philosopher is much nearer the truth.

> " There are the minds of the cells of the liver, and the liver-mind—the mind that regulates the activities of the liver-cells. Above the liver-mind and above the stomach-mind and the heart-mind is the general physical mind ; and, above that general physical mind, and also above the intellectual mind is a higher mind still. There is a hierarchy and kingdom within us."—(Miles,[183], p. 92).

120. As to the third association, we consider that there can be no doubt about the fact that some members receive and do not give. Thus, the flesh receives the power of sensation and life, but has not the power of imparting another faculty in return.

121. As to the fourth—there is also a disagreement both among physicians and among philosophers. On the one hand it is thought that the non-sentient bone and flesh and the like could not continue to live unless these powers were residing in them, and that therefore they do not need to receive ;—that the power provided by the aliments conveyed to them is adequate, and that therefore they neither furnish a power for another member nor does another member furnish them with a power. The opposite opinion is that the powers in those members are not residing in them, but are formed in the liver and heart ; and when they reach these members they come to rest within them. There is no means of deciding between the two views by argument but the inability to do so is no hindrance in practice. As to the first of these two views, one must realize that it does not matter whether the heart be the source of sensation and voluntary motion in the brain, or not ; whether the source of the nutritive faculty be in the liver, or not. It is of no significance whether the brain has in itself the source of the powers of the soul, or whether these powers only come by way of the heart. In any case it is only a *relation.* If the liver is the starting-point of the nutritive faculty, that too is only in relation to other members.

Then as to the second of the two views, one must realize that it does not matter whether the natural faculty in a member like bone is innate in it in virtue of its temperament, or whether it arose in the liver first, or whether neither is true. One must rather realize that the faculty could not be there at all were it not for the liver, and that therefore if the path were obstructed the bone would cease to receive the necessary nutriment, and its functions would cease—exactly as holds in the case of movement when some nerve-connection with the brain is severed. There is the natural faculty in the bone as long as its temperament is maintained.

122. The whole discrepancy is removed by regarding some members as principal or vital, some as auxiliary, and some as neither vital nor auxiliary.

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123. *Classification of Members into Principal* (*or*, *Vital*) *and Auxiliary.*

The *principal* (*or*, *vital*) *organs* are those in which the primary faculties of the body arise—i.e. the faculties necessary either to the life of the individual or to the life of the race.

" In the body is a part which being sound the rest is sound, and which being unsound, the rest is unsound. And this is the heart." (Burton : Night 80).

The principal organs necessary for the life of the individual are three in number :

1—The *heart*, the source or starting-point of the vital power, or innate heat.

2—The *brain*, the seat of the mental faculties, sensation and movement.

3—The *liver*, the seat of the nutritive or vegetative faculties.

The organs concerned in the maintenance of the life of the race are : the three just named, and :

4—The *generative organs*, some of which are essential and others auxiliary. The essential function is that of forming generative elements ; the auxiliary functions are those of giving the masculine and feminine form and temperament. These functions are inseparable from the race, and yet play no part in the essence of life.

The *auxiliary members* are of two kinds : (*a*) preparative,* (*b*) purely or absolutely auxiliary. The former come into operation before the principal members can come into play. The purely auxiliary members come into operation after the principal members have functioned. This is conveniently shown in the following table :

Preparative member.	Member subserved.	Auxiliary member.
Lung.	Heart.	Aorta.
Stomach.	Liver.	Veins.
Liver, with other nutrient members and the guardians of the breath.	Brain.	Nerves.
Testis or ovary.	Generative organs.	Penis and erectile tissues (and ducts.) Female organs carrying the semen to the site of conception. Uterus as perfector of the virtue of the semen.

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* These are the "adnexa."

124. *Classification of the members according to action.*—Galen classified the members into those which effect an action (e.g. heart), those which assist the action (e.g. lung) and those which achieve both (e.g. liver). But for my part, I consider as " action " that particular kind of action by means of which a given member accomplishes the maintenance of the person's life or the perpetuation of the species. Thus, the heart gives rise to the breath. Action is assisted when one member is prepared for receiving the action of the other member, thereby completing the process either of giving life to the individual, or of propagating the race. Thus, the lung prepares the air. The liver carries out the first digestion so far as to prepare for the third and fourth digestion. The more perfectly the liver functions in regard to the second digestion, the more likely is the blood so made to be adequate for nourishing the tissues. Hence in this respect the liver effects an action; and, in so far as the liver assists in accomplishing a further action, so it is preparative for that action.

125. *Classification of the members according to their origin.*—

Some members take their origin *from the semen:* namely, members composed of like parts, except the flesh and the fat. Other members come *from the blood:* namely the flesh, and the fat. Other members come *from both male and female " sperm."** According to the teaching of philosophy, the process of generation may be compared with the processes which take place in the manufacture of cheese. Thus the male " sperm " is equivalent to the clotting agent of milk, and the female " sperm " is equivalent to the coagulum of milk. The starting point of the clotting is in the rennet; so the starting-point of the clot " man " is in the male semen (" We made the life-germ a clot "—Q.23.14). Just as the beginning of the clotting is in the milk, so the beginning of the clotting of the form of man lies in the female " sperm." Then, just as each of the two—the rennet and the milk—enter into the " substance " of the cheese which results, so each of the two—male and female sperm—enters into the " substance " of the " embryo."

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* The word " Sperma " is here really more exact than " semen." Semen = x + sperm. Therefore it is not incorrect to speak of a " female sperm." Note that only a portion of the spermatozoon enters into the new human being, and not all the ovum.

Paracelsus wrote that the " sperm " is not the visible seminal fluid of man, but rather a semi-material principle contained therein, or an " aura seminalis," to which the semen serves as a vehicle (De generatio hominis : Hartmann, [29], p. 72). In another place he says " the matrix attracts the seed of both persons, mixed with the semen, and afterwards expels the semen, but retains the sperm. Thus the seed comes into the matrix. The matrix does not merely mean the womb of a woman; the whole body of the woman is a mother, a matrix."—(De morbo. matric).

Galen gives a contrary account. He considers that each of the sperms has both a coagulative power and a receptive capacity for coagulation ; so he says that the coagulative power is stronger in the male than it is in the female, but the receptive capacity for coagulation is stronger in the female than the male.

But the real truth of the matter is expounded in our own works dealing with the fundamental principles of natural science.

126. *Relations between the female menstrual blood and the embryo.*

1. During pregnancy, the blood which is otherwise discharged from the female at the time of menstruation becomes nutriment (for the embryo) in three ways. One portion is changed into the likeness of the substance of the sperm and the members derived therefrom. This is the nutriment which enables growth to take place. Another portion is not nutriment of that kind, but is capable of being aggregated into the material which fills up the interstices in the principal members and becomes flesh and fat.

A third portion is effete material, and not utilizable for either of the two preceding purposes. It remains in the same situation until the time of birth, and is then expelled with the infant.

After birth, the blood which the liver of the infant makes takes the place of the maternal blood. So it arises from an organ which itself was formed out of the maternal blood.

127. The flesh of the infant is derived from the gross blood, congealed by heat and dryness [cf. the fact that a moderate degree of heat coagulates egg-white]. The fat of the infant is derived from the aquosity and unctuosity of the blood, which cold has congealed and heat dispersed.

128. *Repair of damaged members.—(a) Members derived from the sperm.*

Should a loss of continuity arise in the members derived from the sperm, restoration can only occur, and then only in a few of them, and if the individual is spare in habit, and has not passed the age of juvenility. These members are : the bones, the small branches of veins ; medium-sized veins and arteries. For when disseverance occurs in such members as bone and nerves, they will not grow again.

(*b*) *Members derived from the blood.*

If the members which are derived from the blood are damaged, they are renewed out of like substance. E.g. the flesh.

(*c*) *Members derived from both blood and sperm.*

If the member which is damaged arises both from blood and sperm, then, as it is not very long since the sperm was there, it will be reconstructed (Ex.; the teeth at the age of juvenility) unless meanwhile the blood has undergone a change of temperament. In that case re-construction would not take place.

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129. Sensation and movement is sometimes conveyed to a member through one single nerve, sometimes through several nerves. In each case the nerve is the source of the power.

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130. *The membranes which cover the internal organs.*—These all arise either from the pleura or the peritoneum. Those members in the thorax, which derive their covering from the pleura, are : the diaphragm, the veins and arteries ; the lung. These organs in the abdomen are covered from the peritoneum which covers the muscles of the abdominal wall.

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131. *Texture of members.* All members are either fleshy in texture or fibrous (like the flesh found throughout muscles), or are devoid of fibrous texture (e.g. liver). Fibrous texture goes with power of movement—voluntary in the case of voluntary muscles ; involuntary in the case of the uterus and veins. Compound movements, like that of deglution, depend on the direction of the fibres being various—longitudinal, oblique, transverse. The longitudinal fibres produce in-drawing ; the oblique fibres expel or force onwards ; the transverse fibres grip and hold.

Even where a member has only one coat, as is true in the veins and bladder, there are still three kinds of fibres which interweave one with another. Members which have two coats have the cross fibres externally, and the others on the inner side. The longitudinal fibres tend towards the inner surface. The purpose of this arrangement is that in-drawing and expulsion should not occur simultaneously, whereas there is no objection to the acts of in-drawing and holding and gripping occurring together—except in the case of the intestines, where much retention is disadvantageous, whereas in-drawing and expulsion are all-important.

132. *Hollow* (tubular) members which contain substances different from their walls have sometimes one coat, sometimes two. The presence of two coats serves the following purposes :

(1) to provide the necessary strength to the walls, so that there is no risk of the proper power of movement failing at any time. Ex.: arteries.

(2) to ensure that the contents shall not dissipate or escape. One coat would not suffice to retain so tenuous a substance as the breath which the arteries contain ; and it would make the risk of rupture or severance in injuries too great, in which case death would be very liable to occur because the blood would then drain out.* This is a very great danger.

(3) where there is a demand for vigorous suction and expulsion, it is beneficial to have a separate instrument available for the performance of both actions rather than to distribute both powers over the one coat. This applies in the case of the stomach and intestines.

(4) where each coat of a member subserves its own action ; or each action requires its own particular temperament. Thus, in the case of the stomach, there is a need of a power of sensation (which can only exist in a tissue containing nerves) and also a power to execute the movements of digestion (for which a fleshy tissue is needed). Hence each need is supplied by its own coat—the nerve-containing tissue for the power of sensation ; the fleshy coat for the power of executing the movements entailed in the work of digestion. Nature made the inner coat capable of sensation, and the outer coat fleshy. The operation of sensation requires actual contact with the nervous tissue, as is true in the case of the sense of touch ; but the movements necessary to enable digestion do not require contact of the material to be digested with the fleshy walls.

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133. Certain members (e. g. the flesh) have a temperament so near to that of blood that the latter needs to undergo little change in order to subserve nutrition. Consequently there is no need for apertures or for spaces or cavities in these members, wherein to retain nutrient material pending its transformation into their own substance. In such members the nutrient at once becomes identical with their substance.

134. But other members (e.g. the bones) have a temperament which is very different from that of the blood. Therefore before these can be nourished, the blood must needs undergo a series of successive transformations before becoming like to them in substance. That is why spaces were made in which nutriment can be retained long enough to enable the conversion to take place. This is true in the case of the femur and humerus. In the case of the lower jaw bone numerous apertures are seen scattered through it. In this way more nutriment can be accommodated than is necessary for the moment, and the transformation into their own likeness can take place little by little.

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* Note this proof that Avicenna knew the arteries contain blood.

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135. Lastly, strong members expel their waste matters into the adjacent weaker members. Thus the heart to the axilla ; the brain to the tissues behind the ears ; the liver to the groins.

§ 118. The next four subsections of the text are omitted. They deal with the anatomy of the bones, muscles, nerves and blood-vessels, and are naturally inadequate in comparison with modern Anatomy.

Ancient anatomy has been criticized for allowing as a basis the dissections of monkeys and other animals, apparently overlooking the important factor of circumstance, in order to give the impression of lack of acumen in those days. But in our days, ability and acumen being taken for granted, it is considered allowable to base conclusions in the domain of physiology and pathology upon laboratory reactions obtained from the same kinds of animals. Some workers are alive to the possible insufficiency of data so obtained, but make a virtue of necessity. This may also be claimed for Avicenna.

Avicenna was seeking to express a certain truth in these subsections as well as in other parts of the Canon, and it is profitable to abstract it and develop it further in the light of modern knowledge. The following are some of the considerations in mind.

§ 119. *The variations of anatomical structure* which are observed throughout the animal kingdom are the expression of the differing nature and requirements of the respective animal-types. But in dealing with comparative anatomy it is usual to regard evolution as the essential factor, and a false meaning to the phenomena is thereby instilled. We speak of animals as " higher " and " lower " for convenience, but strictly all are equal, because " each creature has such perfection as it was possible for it to have." (St. Thomas,[82] p. 108), and its place is in accordance with the " end " for which it was brought into being, the word " end " bearing the scholastic sense. The proper use of the theory of evolution in comparative anatomy, like that of Ehrlich's theory in regard to immunity, is that it enables many discrete facts to be memorized. To raise either to the dignity of " truth " necessitates an overlooking of the fundamental properties of the nature of being.

§ 120. *Deformities.* These may be explained on an evolutionary basis, using the ideas of " reversion," " atavism," etc. When the individual is studied in regard to his " end " (in the scholastic sense) a different conception comes to light. But as this brings in the question of events belonging to the category of morals (" to the third and fourth generation "), the problem is at once evaded. Such a conception would not be vitiated by the existence of deformities among animals.

§ 121. *The intimate structure of the body is always changing* although the anatomical structures appear to remain unchanged.

Hence it is possible to see in these structures merely a locus for the various faculties and functions pertaining to the physical, mental and emotional life of the individual. Compared with his existence in the scheme of things, the anatomical details are mere " moments musicales."

To take a special example, one might regard the blood-forming centres as the (momentary) point of meeting of two vitalities. (Cf. §147.)

§ 122. *Relation between structure and function.* This formed the subject of a classic in medical literature—that in which Galen regards anatomy as the expression of the φυσις. Such a teleological view is not in favour to-day, and, indeed mistakes (as Galen did) the root principle emphasized in these pages. To use the symbolism given in § 56, 64, *M* is not the " expression " of *F*. In associating structure with function this must always be remembered. The examples available for Avicenna, striking as they seemed to him, are surpassed by those possible through modern knowledge. Thus, harmonious succession of events, both in time and place, is to be discerned throughout the body. The output of the various digestive juices, separately achieved, yet co-ordinated as to time is also co-ordinated as to place. The output of bile, for instance, is fitful—sometimes a delicate trickle, sometimes in spurts, sometimes in larger quantities ; and this in co-ordination with the activity of the muscular bundles beneath the membranes which secrete the digestive fluids—in which both nervous and vascular variations play an intimate part.

Out of many other instances, the following may be given. The adrenal vein joins the inferior vena cava at a given point, in order to secure that the adrenal secretion shall enter the blood in time to receive the activating substances supplied for it by the liver *before* it becomes exposed to the oxygen contributed by the respiration ; for otherwise the activation would be nullified. (Cf. Sajous[149].)

§ 123. *Transcendence of organs, fluids, and the like, beyond anatomical boundaries.*—This has already been referred to in the opening chapter. Thus (*a*) " heart " includes the arterial system and something more ; " liver " includes the venous system and something more ; " brain " similarly goes beyond the organ within the cranium to the cutaneous nerve-endings. This is why a " function test " for a given organ is never satisfactory. (*b*) Vascular channels and tissue spaces are simply demarcations of fluids from adjoining tissues. The river exists because there is water to flow, and incidentally is an " anatomical feature " of the country,serving various purposes. Its presence is the indication of, and continues only as long as, certain incessant changes occur in Nature at large. To use other words, the vascular channels are the materialization of the stream of blood ; or, the current of " life " *made* the blood-vessels become demarcated. (*c*) The humours of the body circulate also in the subtle fashion suggested thus : the sanguineous humour is not only in the blood vessels but also in lymph channels : the serous humour moves in the connective-tissue spaces as well as in anatomical lymphatics, and appears also in the form of the " eau de constitution "

(Vallery-Radot[141]) of the tissues: the bilious humour may be followed in the track of cholesterin (and other constituents.) The constant loss of hair, nails, teeth, should also be recognized as being part of the constant separation of "superfluities." (Cf. Paracelsus[29]). (*d*) If we realize that tissue-spaces and cavernous tissues are forms of channels, it will be clear that the whole body is really an aggregate of "tubes" of some sort. It may then be said further, that disease always starts from tubes,—namely when their lumina are blocked or when their "walls" become semipermeable or quite impervious.

§ 124. Anatomical structures depend for their existence on chemical structure. Water, for instance, may be said to come into visibility in the form of an anatomical structure. Conversely, other substances are only visible as long as they are not yet an integral part of the living substance of the body, and others are visible because they have ceased to be such.

As soon as microscopic visibility is attained, the visible thing has ceased to be "living." Stability of form entails the stagnation of certain substances, and also implies that they have been rejected from the cycle of life in order to provide the substrate or platform or *points d'appui* for the actual living substance (i.e., the life-principle) to manifest its faculties during a certain (often limited) period of time. Cf. § 121.

§ 125. *Histology* (i.e. microscopic anatomy) *and function.* From the preceding consideration, when a tissue is observed through the miscroscope, the thought should be "that is the spot where this or that substance has emerged into visibility at this moment." This conception is specially applicable to the case of the blood-cells. Cf. § 95-99.

§ 126. *Anatomy as the expression of strengths and weaknesses.* It is clear that the relative development of different parts of the body, from head to foot, reveals its physical strengths and weaknesses. Where one part is strong, another is compensatorily weak. But it is less obvious, and less realized, that anatomical conformations are also revelations of strengths and weaknesses of mental make-up. Here also, the strength of one feature goes with deficiency of some other. The root principle of jelal and jemal already referred to (§ 82) holds good throughout, and in a multitude of directions. Mental capacities and activities affect the vegetative processes just as do the emotions, for their influence lasts throughout life. As S. Thomas says: (*a*) "every operation of the sensitive soul belongs to the composite" (S.T., 75, 3,[84] p. 10). (*b*) "There are certain operations common to the soul and the body, such as fear, anger, sensation, and so forth; for these happen by reason of a certain transmutation in a determinate part of the body, which proves that they are operations of the soul and body together" (C.G., ii. 57, [82] p. 139). (*c*) "We find in the intellective appetite, which is the will, operations specifically similar to those of the sensitive appetite, differing in this, that in the sensitive appetite they are passions, on account of its connection with a bodily organ, whereas in the intellective appetite they are pure operations. For just as by the passion of fear which, in the sensitive appetite, one shuns a future evil, so without passion, the intellective appetite has a like operation " (*ib.*, [82] 90, p. 190).

§ 127. From all this it is clear that much is to be learned from external anatomy (head, face, hands, joints, skin markings, etc.) as to the strength and weakness, not only of the body as a whole, but of the several organs in particular. Were the study of internal anatomy combined with the external, the associations would be more appreciated. The " case " is not really finished when a " handful " of viscera has been studied in the autopsy-room or even in the laboratories attached thereto. The remaining " shell " passes on into oblivion bearing its wonderful secrets with it, for its language is such that however loudly it " speak," there are few with ears to hear, and perhaps none with ability to interpret.

General Physiology

THESIS VI

THE FACULTIES OF THE BODY

" LIFE appears through various operations in different degrees of living things " (S. Thomas, S. Th. q. 76, art. 1).

1. GENERAL DISCOURSE ABOUT THE SEVERAL KINDS OF FACULTY

FACULTIES (**136**) are to be distinguished from functions. The difference is that the former originate the latter. But as each function depends on its own special faculty they can be treated together.

Faculty : the name of a property whereby the phenomenon of life is manifested. Function : actualized potentiality.

Faculty = power = potentiality. Faculty is *not* force ; it is potential power ; it is static. Power is the faculty in a state of activity ; it is dynamic.

The *tout ensemble* of faculties is " the soul."

The *tout ensemble* of functions is " life." See § 150.

Weakness of faculty corresponds to " hypofunction." Plethora of faculty corresponds to " hyperfunction ".

137. There are three kinds of faculty, and therefore of functions proceeding therefrom. Namely, the vital (*ḥaywaniat*) ; the natural (*ṭaby ‘yat*) and the animal (*nafsaniat*).

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§ 128. These three terms, derived from the Latin version, only properly express the meaning of the Arabic if they are taken in their original sense. The third term is rendered " psychical " by some translators,[163] but is open to objection because its modern usage does not sufficiently correspond to the idea of *nafsaniat*.

Other words are preferred in the course of the present translation. The familiar " vitality " is convenient for the first term. The words " vegetative " and " sensitive," employed in the Dominican translation of the Summa,[84] are satisfactory renderings for the other two terms, and are to be understood strictly in the Thomistic sense. The term " natural " is reverted to in **551** for reasons there given.

The variations in scope exhibited by these and allied terms are conveniently indicated in the following table.

§ 129. ANALYSIS OF CERTAIN TERMS APPLIED TO LIVING THINGS :—i.e., BEINGS ENDOWED WITH "LIFE."

		A. Vegetable.	B. Animal.	C. Human.
I. *Distinctive quality.*[1]				
1. In Modern language.		Vegetative. Organic. Organo-vegetative (Martinet)	Sentient. (Lower) mental powers.	Rational ; intellectual, Higher mental life, Psychic powers.
2. Platonic term.		Nutritive.	Appetitive.	Rational.
3. In Avicenna.[2]	Vital.[3]	Natural.[4]	Animal.[5]	Ratiocinative faculty.
4. Scholastic terms.		Vegetative (life or soul).	Sensitive (life or soul). Sensuous (Necessarily implies "appetition,"[64] 78, i. p.78)	Rational (life or soul).
II. *These terms are based on—*				
(*a*) the faculties pertaining to each				
(i) Pre-modern thought.		Plants have only nutrition, growth, and reproduction.	Animals have also sensation and movement.	Human beings have also intellect or intelligence.
(ii) Modern thought.		*But* modern research (cinematograph, etc.) shows sensory and motor powers.	*But* some animals exhibit intellectual powers often supposed to be purely human.[7]	*But* this is not so for some races of men, and in some cases of disease of the brain.
(iii) In terms of Consciousness.		Unconscious life.	Subconscious life and lower conscious life.	Fully conscious life
(*b*) On essential manifestations (3. Avicenna).	As "breath"[6]	As "nature."	As sensation, movement, and cogitative power.[7]	As capacity for abstract concepts.
(*c*) On fundamental causes. (4. Scholastic basis.)		Effected by means of a corporeal organ, in virtue of a corporeal quality.	Effected by means of a corporeal organ, but not in virtue of a quality. Deals with particulars.	Is effected apart from a corporeal organ or quality. Deals with universals[64] (78, i. p. 78).
(*d*) on theological considerations.		Mortal.	Mortal.	Immortal : (*a*) absolutely (Scholastic view) ; (*b*) conditionally (some creeds).
III. *Chief organ concerned.*				
1. In modern thought.		All vegetative organs equally important (Biochemical processes in general).	Nervous system (automatic and central).	Brain (Grey matter of cortex.)
2. Platonic.		Liver.	Heart.[8]	Brain.
3. Avicenna.	Heart.[8]	Liver (and Gonads)	Brain.	
4. Scholastic.		All viscera. No special organ because "life" belongs to all.	Nervous system, but also the whole "being."	No material organ.

Notes on points arising out of this table :

[1] *Boundaries of the Three Kingdoms* :—These are admirably set out in Chahar Maqala[7] : "When the vegetable kingdom was produced, God gave it the four forces and the three faculties. When the animal kingdom was produced, God added two more faculties—that of perception (with five external senses and five internal senses), and of movement. When the human kingdom was produced, God added a capacity for abstract concepts (intelligence)."

[2] Avicenna's division : this is determined by medical requirements.

[3] *Vital faculty.*—This is not specifically mentioned by S. Thomas, because implied in the word "life." He refers to it thus : "The vital operation . . . whereby something is shown to be living"[84] (liv. 2. p. 44). "Life-principle" has a wider scope than implied in "vital faculty" :—"The vital principle is the 'form' or determining principle of the living being. Coalescing with the material factor it constitutes the living being. It unifies the material elements into one individual. It holds them together . . . as a mass of chemical compounds, many of them most complex and in very unstable equilibrium, constantly undergoing change and tending to dissolution into simpler and more stable compounds. When life ceases, the process of disintegration sets in with great rapidity. The function, then, of this active informing principle is that of a unifying, conserving, restraining character, holding back, as it were, and sustaining the potential energies of the organism in their unstable condition."— (Maher[17], p. 427).

[4] *Natural faculty.*—i.e., "pertaining to the 'nature.' That is, (*a*) the mere fact of living at all, (*b*) powers in common with laws of Nature in general. Compare the term "natural science," "natural philosophy" (used before the present era) applied to the modern chemistry, physics and their subdivisions. The ancients recognised that physiological phenomena in regard to the "natural" life were kin to those of our chemistry and physics.

Note also the meaning of "nature" in : "the natural appetite is that inclination which each thing has, of its own nature, for something. Wherefore by its natural appetite each power desires something suitable to itself."[84] (p. 78).

[5] *Animal faculty.*—The word "animal" really denotes simply "a thing with an anima" ; hence man is an animal. But different people among all nations use the word (in their own language) entirely vaguely, and thus give rise to perennial confusion of thought when applying it in daily life. The following meanings are assigned to it :

(i) Generally or collectively, it refers to the presence of life : e.g., anima-te ; in-anima-te.

(ii) Specifically or particularly. (*a*) indefinitely as (a ′) "soul" (*a* ′′) "mind" (*a* ′′′) "spirit" (quaecumque substantia invisibilis"[85]—i. 41, 3, 4). (*b*) More definitely = $\phi\upsilon\chi\eta$ = lower soul, as opposed to animus, the higher soul, whose seat is the "heart," the centre of cognitive and emotional life.[17] (xiv. 153). See §150, 151.

[6] Manifestation as "breath" ; or, by means of the breath. See § 161. Breath = spiritus, which is defined by S. Thomas as "an instrument of the soul, *tenue, lucidum, calidum, ex puriore sanguine*" (i. 41. 3. 4). cf. preceding note, under "spirit."

[7] S. Thomas recognized such powers in animals : "Cogitative and memorative powers are not distinct, but the same, yet *more perfect* (in man, that is) than in other animals."[84] (78. i. p. 90).

[8] *The heart.*—In the platonic view it is the chief organ of the appetitive soul ; in Avicenna it is that of the breath. See §§ 136-141. But this would make the appetitive soul equivalent to the vital faculty, which it is not. Another objection to the platonic view is explained by S. Thomas[85] (p. 145).

§ 130. "Only three powers or parts of the soul are commonly assigned—namely, the vegetable soul, the sensitive soul, and the rational soul. . . . There are five genera of powers of the soul—the vegetative, the sensitive, the appetitive, the locomotive, and the intellectual. Of these, three are called souls, and four are called modes of living." . . . The reason of this diversity lies in the various souls being distinguished accordingly as the operation of the soul transcends the operation of the corporeal nature in various ways ; for the whole corporeal nature is subject to the soul, and is related to it as its matter and instrument. There exists, therefore, an operation of the soul which so far exceeds the corporeal nature that it is not even performed by any corporeal organ; and such is the operation of the rational soul. Below this, there is another operation of the soul, which is indeed performed through a corporeal organ, but not through a corporeal quality, and this is the operation of the sensitive soul; for though hot and cold, wet and dry, and other such corporeal qualities are required for the work of the senses, yet they are not required in such a way that the operation of the senses takes place by virtue of such qualities: *but only for the proper disposition of the organ.* The lowest of the operations of the soul is that which is performed by a corporeal organ, and by virtue of a corporeal quality. Yet this transcends the operation of the corporeal nature; because the movements of bodies are caused by an extrinsic principle, while these operations are from an intrinsic principle; for this is common to all operations of the soul, since every animate thing, in some way, moves itself. Such is the operation of the vegetative soul; for digestion and what follows is caused instrumentally by the action of heat, as the Philosopher says."—Sum Theol.[83] Q. 78, art. 1: Trans.,[84] p. 75, 76.

138. Many philosophers, and all physicians who follow Galen, consider that each faculty has its own principal member, which forms its storehouse, and from which its functions emerge. On this view the rational faculty resides in the brain, and its functions proceed from the brain. (Cf. § 130).

139. The *natural or vegetative faculty* is twofold, and includes (i) the *nutritive* faculty, which is concerned with the welfare and preservation of the individual, and secures nourishment to it to the end of life. This faculty resides in the liver, and its functions emerge therefrom. (ii) the *reproductive* faculty, which ensures the propagation of the race. This subserves the process of generation, and separates the substance of the sperm from the humours of the body and fashions the new body according to the decree of Allah. The seat of this faculty is the generative organs, and its functions proceed from them.

140. The *vital faculty* preserves the integrity of the breath, and is the vehicle of sensation and movement, and makes the breath able to receive these impressions (of sensation and movement), and, having reached the brain makes it capable of imparting life, and then spreads in every direction. The seat of this faculty is the heart, and its function proceeds from this. (See **162-167**).

141. Now the great philosopher Aristotle believes that the heart is the source of all these functions, though they are manifested in the several principal organs. But physicians still keep to the opinion that the brain is the chief seat of sentient life, and that each sense has its own distinct member whereby it manifests function. But if physicians thought over the whole matter as thoroughly as they should, they would take Aristotle's view instead. They would find that they have been only regarding appearances instead of realities, taking non-essentials for essentials. (Cf. **119**, **165**). The establishment of this truth is for the philosopher and natural scientist, and not for the doctor as doctor. But the latter, looking on members as being initiators of the faculties instead of as their manifestation—thus despising or ignoring philosophy—fails to see which things are prior, and accordingly overlooks the proper basis for the treatment of diseases, and for the remedying of bodily defects (*p*).

" There is in the body no one beginning, but all parts are alike beginning and end ; for a circle has no beginning." (Hippocrates).

2. THE NATURAL FACULTIES

142. The *natural faculties* are divisible into two groups : (*a*) *dominant* or directing, (*b*) *subservient* or obedient.

The *dominant faculties* are twofold : (i) concerned with the preservation of the life of the individual ;—the nutritive faculty and the augmentative faculty (power of growth), (ii) concerned with the preservation of the race :—the generative faculty ; and the formative or plastic faculty.

§ 131. *Classification of the Natural Faculties.*

General purpose.	Dominant faculty (ḥadima)	Subservient faculty Khadama.	Synonyms.	Qualities.	Element	Corresponding Mental process.
The Individual	Nutritive (ghāzīa) (**143**) " The four handmaids of nutrition."	i. Attractive Jādhiba (**147**)	Apposition. Presentation Prosthesis.	Hot and dry.	Fire.	Perception.
		ii. Retentive Māsika (**148**)	Agglutinative Adhesion. Prosphysis.	Cold and dry.	Earth	Memory.
		iii. Alterative Hādima (**149**)	Transformative. Assimilative-poietic (e.g. haemopoietic).	Hot and moist.	Air.	Cogitation
		iv. Expulsive Dāfi'a (**150**)	Propulsive Expeditive.	Cold and moist.	Water	Expression.
	Augmentative (nāmīa) (**143**)		Auxetic. Plastic. Incremental.			Acquisition of knowledge.
The Race.	Generative (muwallida) (**145**) (1) in the strict sense (2) primary transformative faculty (mughayyara)		The masculine factor. (Tr.)		Aether	Creative and Inventive faculties.
	Informative (maṣawwira) (**145**)		Plastic. Operates in utero. The feminine factor (Tr.)			Constructive faculties.

143. *The faculties pertaining to the preservation of the life of the individual.*

The nutritive faculty is that whereby the aliments are transformed into the likeness of the thing nourished, thereby replacing the loss incidental to the process of life.

The augmentative faculty is that whereby the increase in size of the body in all directions in just proportion is secured. This is brought about by means of the substances derived from the aliments. The nutritive faculty is subservient to this augmentative faculty in so far as it enables the preparation of the requisite substances from the aliments, but growth will not occur unless more is supplied than is lost. However the supply of more substances than are lost does not necessarily produce growth. Growth implies an increase in all directions in the proper proportions. To become fat or obese with advancing years, after being slim, is not growth. It is not growth unless the increase is in all dimensions and in natural proportions, so as to culminate in a state of perfection of growth. Adiposity, for instance, is not a perfection of growth before adult age, any more than it is a perfection for the figure to be very slim after maturity to a greater degree than natural.

144. There are three special functions in the process of nutrition. (i) the *apposition* of the altered material, namely, the blood, or a humour which is potentially like the tissue to be nourished. If this process is defective, as may happen in disease, there is " atrophy," which is a defect of nutrition. (ii) *agglutination*—a later stage. Here the nutriment apposed to the tissue is now fully united up to it, and made a part of it. This may be lacking owing to disease, and then occurs what is called " fleshy dropsy." (iii) *true assimilation*—a stage still further where that which has been made into a part of a member becomes absolutely like it in all respects, in essence and colour. This fails in such conditions as leprosy and vitiligo, in which cases the first two functions are achieved, but not the third.

These three procedures are the work of the transformative power. This is really a single faculty, though distributed among the respective members. For in every member this faculty is corresponding to its temperament, and so transforms the aliment into the likeness (ad-similis) of that member ; in each case it differs from that which transforms aliment into the likeness of the various other members (or tissues). So (we may say) the transformative faculty of the liver ramifies throughout the whole body.

145. *The faculties pertaining to the preservation of the race.*—The generative faculty is two-fold. (i) That which gives rise to the male and female " sperm," the reproductive units, (ii) the formative power (i.e., in the male element) which separates from one another the various faculties in the sperm and rearranges them in such a way that each member (and tissue) receives the temperament appropriate to it—thus, to nerve, its distinctive temperament ; to bone, its distinctive temperament. The one " sperm," apparently homogeneous, opens out in all these directions. This is called the *primary* transformative faculty.

The *informative* or *plastic faculty* (lit. as in making a sculpture or painting) is that (in the female element, Tr.) whereby, subject to the decree of Allah, the delineation and configuration of the members is produced, with all their cavities, foramina, positions and relations to one another, their smoothness or roughness, and so on—all being controlled up to the final limits of their natural growth (dimensions). Subservient to this faculty, in regard to that part of the nutriment which serves for the preservation of the species, are the nutritive faculty and the power of growth.

§ 132. From the annotations by Costaeus : reproduction implies a plastic faculty ; and that implies transformative power, and that depends on the four qualities. Growth cannot occur without nutrition ; nutrition cannot occur without agglutination or assimilation ; agglutination cannot occur without apposition ; assimilation cannot occur without transformation ; transformation cannot occur without retention ; and retention cannot occur without affinity. Each successive step entails the removal and excretion of the products and by-products of the preceding steps, for these are hindrances to reproduction, nutrition and growth.

3. THE FACULTIES SUBSERVIENT TO THE NATURAL FACULTIES (VEGETATIVE LIFE)

146. VEGETATIVE LIFE (i.e. the natural faculties) is subserved by four faculties : attractive,* retentive, transformative,† expulsive.

147. The *attractive faculty* was created so that the body could draw to itself whatever nutriment is required for its preservation. The longitudinal fibres in an organ form the instrument used for the purpose. The liver attracts the chyle from the stomach by sucking, as it were, the purer parts thereof by way of the mesenteric veins.

148. The *retentive faculty* was made so that the material so drawn in could be held (in position) during the time that the alterative (transformative) faculty is engaged in preparing sound nutritive substances from it. The instrument employed for this are the oblique, and in part, the transverse fibres. (In the case of the liver, the chyle is retained in it long enough to enable the sanguificatory power to act upon it.)

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* The word attractive, in the original, is primarily with the thought of the attraction of (female) beauty and has a peculiarly appropriate application in consequence.

† " Ferment " actions of the body belong here.

149. The *alterative* or *transformative* faculty is that which alters the material attracted and held by these two powers. It transmutes the material from its former state until it has become worked up into a temperament such as enables it to become efficient nutrient material. This process is " digestion " in the strict sense.

At the same time it produces a change in the superfluities so that they can be easily discharged from the member containing them. This process is called " *maturation*." By its means three things happen : (1)—the texture of the superfluities becomes attenuated, when it is inspissation that hinders expulsion ; (2)—the texture of the superfluities becomes thickened, when it is attenuation that prevents their discharge ; (3)—the superfluities are entirely broken up, if it be viscidity that hinders expulsion. It is a mistake to use the terms " digestion " and " maturation " as synonymous.

150. The *expulsive faculty* is that whereby the superfluities from digestion are expelled. Superfluities are such as are unsuitable as nutriment, or are in excess of requirements (and therefore " superfluous "). By means of this faculty, the waste matter is expelled into the bladder as urine, and other excreta through their several appropriate organs and apertures. Where there are no orifices, the wastes are transferred by this faculty from noble to less noble organs ; from hard structures to soft ones. And if there is a diversion of waste matter from the proper route, the expulsive faculty cannot remove as much as otherwise.

151. *Inter-relations between the faculties and the qualities.*—

These four natural faculties are subserved by the four primary qualities—heat, cold, dryness, moisture. Strictly speaking, heat is the underlying factor in all the subservient faculties.

152. *Action of cold.*—While cold aids all four faculties it does so indirectly and not directly—except in so far as it is the contrary of all the faculties. For all the faculties act in virtue of movement, which is shown not only as attraction and expulsion, but even in the transformative process (digestion proper) ; for the latter consists in the separation of gross and aggregated particles from one another, and in the condensation together of the finer and separated particles. The movements of dispersion and aggregation are simultaneous. Movement is also concerned indirectly in the retentive faculty, because the transverse muscular fibres come into play. Coldness enfeebles, stupefies, and mortifies, and hinders this faculty in all its functions ; yet, indirectly, it helps it by fixing the fibres in the position referred to. Therefore it is not directly concerned with the faculties ; it simply causes their instruments to be in a state which will help their functions to be maintained.

Coldness aids the expulsive faculty (1) by preventing the dispersal of the gases which favour peristalsis, (2) by keeping the particles of the aliment coarse, (3) by its astringent action upon the transverse muscular fibres. In these ways coldness renders the instruments of the faculty in an appropriate state. Evidently, then, it only helps the faculty indirectly. Did it act directly, it would obstruct and weaken the movements.

153. *Action of dryness.*—Dryness is directly instrumental in the functions of two faculties—namely the alterative and retentive. It is auxiliary in the case of the other two—the attractive and expulsive. This is because dryness delays the movement of the breath, enabling it to take on with it those faculties which it has encountered with a vehement impact. It also prevents the moisture present in the substance of the breath or its instrument from flowing away. Dryness helps the retentive faculty because it favours (muscular) contraction (i.e. upon the contents of the organ). The transformative faculty needs moisture (and not dryness).

154. *Comparative relations between the qualities and the faculties.*—If one compares the degree of active and passive quality requisite for the various faculties, one finds that the retentive faculty needs more dryness than heat. This is because more time is required for a movement to come to rest than is needed to start a contractile movement of the transverse fibres.

155. Heat is necessary for movement, and it takes only a short time to produce its effect, so that the remainder of the time is occupied in holding the material and coming to a state of rest. This explains why the temperament of juveniles tends to moistness, for their digestive power is weaker.

156. The attractive faculty needs more heat than dryness because the chief feature of attraction is movement, and movement demands heat. The organs concerned must move rather than be at rest and contracted (for which dryness is needed).

Not that much movement is required for this faculty, though at times violent activity becomes necessary. Attraction is brought about (*a*) by an attractive faculty—as when a magnet attracts iron, (*b*) by heat, as when oil is drawn up in a lamp.—Some physicists assert that the last-named is really an example of filling up of a vacuum.

Heat increases the power of the attraction exerted by the attractive faculty.

157. The expulsive faculty requires less dryness than the attractive and retentive faculties, because there is not the need of the muscular contraction requisite for retention, nor for the apposition necessary for attraction ; nor a need to maintain contraction upon an object until the next stage of the process is reached. Nor is there a need for repose ; but, on the contrary, there is a need of movement, and also a small amount of inspissation—just enough to ensure that degree of compression and expulsion which is necessary to make the contracted viscus an instrument. Lastly, whereas the retentive faculty requires a long period of time and the attractive power only a short period—namely that necessary to bring one thing in contact with another—so there is less need of dryness.

158. The transformative faculty requires more heat than the other three. It does not need dryness but moisture, for by moisture the nutrients are rendered fluid and so become able to enter the pores and become moulded into the conformation of the channels to be traversed. But one must not suppose that because moisture aids digestion, juveniles (whose temperament is moist) can digest hard or indigestible foods. This can be done in youth, but here the reason is not to be found in their moisture ; it is because at that period of life the "nature" is similar to that of the foods in question. Foods of hard nature are not appropriate for the juvenile temperament (which is soft), and therefore their transformative faculty cannot cope with such food ; their retentive faculty cannot hold it, and their expulsive faculty rapidly expels it. In the case of youth, on the other hand, such hard food is quite suitable for nourishment.

159. The following brief table gathers together these points :

	Duration of muscular contraction.	Amount of longitudinal movement achieved.
Attractive Faculty.	Quite short	Marked.
Retentive Faculty.	Long ; continued.	Moderate.
Alterative Faculty.	Continued.	None.
Expulsive Faculty.	Momentary.	Considerable, but superadded from without.

The alterative faculty needs liquefaction and commingling of substances.

160. So the various faculties make use of these four qualities in diverse ways and to different extents.

§ 133. Thus, the attractive faculty is not equal in degree in all organs. Heat is stronger in the liver than in the stomach and intestines, in arteries than in veins. The liver at one time is hotter (and therefore the attractive faculty is greater) than at another. So also in the case of the stomach. Hence, if the stomach is empty and the liver is hot, the stomach will draw out the serous humour and bile from the liver. Just as a strong person can take something out of the hands of a weak person if he wants to, or, on another day, the weak person is the stronger* (Cf. Galen, Daremberg,[19] ii. p. 307).

" The operation of the vegetative principle is performed by means of heat, the property of which is to consume humidity."—(Sum. Theol.[44] 75, p. 81.)

4. The Vital Faculty.

161. The power which the members receive before they can acquire the capacity for the faculties of sensation and movement, and for accomplishing the various functions of life, is called the " vital faculty." Closely related to this (subject) is (that of) the " breath," and therefore also of the emotions of fear and anger, because they coincide with the expansion and contraction of the breath. (*p.*)

§ 134. Vital faculty = virtus vitalis = vitality = innate heat = " spirits " (corporeal, vital, natural, animal) = breath (which is its manifestation) = Spirit = " refined form of bodily substance or fluid believed to act as a medium between mind and the grosser matter of the body."[17] (xv. 220) = "a kind of very subtle body which penetrates all parts of the material body and infuses them like the essence of a rose, oil in sesame, butter in milk" (Motazelite view,[13])

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* There is a striking parallel to this passage in the " I t'ung chêng mo " (circa A.D. 1056), on page 25 of the subdivision " Mo Chueh Chih Chang " : referring to the changing dominance of the types of " breath " in the various organs, perceptible by a study of the pulse. The author states : " it is just like the case of the king of Wu, who obtained the supremacy over the dominion of Chu, and then neglected his own defences. The king of Yu seized the advantage of his unprotected state, and in turn obtained the possession of his territories."

Cf. § 118, § 136; and see **167-173**.

In part it corresponds to "life principle," and also in part to "substantial form." But it is *not* the "soul"; it is one of the powers of the soul; the soul is a "bundle of life"; i.e., a bundle of faculties and powers which complete the material body. Soul: body:: vibration: atom.

162. We now proceed to enlarge this brief statement. On the one hand there are bodies of dense substance—the organs and tissues—which are derived from the dense particles of the humours of the corresponding temperament; and on the other there is the "breath," derived from the rarefied attenuated particles of the humours of corresponding temperament.

163. Physicians regard the *liver* as the seat of manufacture of the dense part of the humours, and the *heart* as that of the rarefied part. Really speaking, as soon as the breath and the appropriate temperament meet, the vital power comes into being, and thus all the members are rendered capable of receiving all the other faculties (of the soul)—sensitive and otherwise. The sensitive faculties do not appear in the breath and members until this vital power has come into being, and so even should the sensitive faculties in a given member be lost, life will remain in the part until the vital power has forsaken it. Does one not find in practice, how a limb is devoid of sensation from paralysis (whether as a result of a temperament which renders it incapable of receiving sensation or showing movement, or because of some obstruction to the current from the brain and nerves into the limb) yet continues to live? and does one not find that a limb which has lost the vital power loses also sensation and movement, dies, and undergoes putrescence and decomposes? That shows that the power which renders a member living is still there even in the paralysed member, so that sensation and movement would return again, could the obstruction be removed. In fact, the intact possession of this vital power makes the limb always ready to receive the attributes in question. That which obstructs these attributes does not interfere with the power of receiving vital breath; the member itself is not dead.

Further, it is not the nutritive faculty that prepares a member for receiving sensation and motion. It is not the nutritive faculty that is fundamental for the life of a member. One cannot say that a member perishes as soon as the nutritive faculty is abolished. The statements just made about a paralysed limb apply equally to the nutritive faculty. For sometimes the nutritive faculty ceases in a member and still the member continues to live. Sometimes the nutritive faculty is unimpaired and nevertheless the member tends towards death.

Then again, if it be the nutritive faculty which provides the power of sensation and movement, should not plants also share in these powers?

164. Hence it is clear that there is something else preparing (the members for these powers), something akin in temperament to itself—and this something is the vital faculty. This is that faculty which appears in the breath at the very moment at which the breath develops out of the rarefied particles of the humours. As the philosopher Aristotle says, from that moment the breath receives its first beginning and all the other faculties flow out from it. Not that the activities of these faculties are directly derived from the breath, any more than the sensation (as doctors agree) proceeds from the animal breath in the brain until the sense-impression has passed the crystalline lens, or the tongue, or the other sense-organs. It is when the particular portion of the breath reaches the appropriate parts of the brain that it becomes impressed with the temperament of the brain and thereby becomes adapted for the operations of the faculties proceeding from and reposing in it.

The same applies in the case of the liver and reproductive organs.

165. The opinion of physicians differs from this. They state that unless the temperament of the breath becomes altered in the brain the breath is not capable of responding to the soul (anima, nafs), the source of sensation and movement. But they admit that the initial temperament of the breath plays a part in enabling it to receive the primary vital faculty. The same thing holds for the liver, and other principal members. From this point of view, however, there would have to be a separate soul (anima) for every kind of action; the soul would have to be really an aggregate of various souls, instead of being one single agent from which the several faculties emanate.

§ 135. Scholastic argument against such a conclusion.—"If man is to be understood as three or two (souls) using a body, it follows that man is not one thing, but two or three, for he is three souls or at least two. And if this be understood of the intellective soul only, so that the sensitive soul be understood to be the body's form, and the intellective soul, using the animated and sensified body, to be a man, this would again involve absurdities, namely that man is not an animal, but *uses an animal*; and that man does not sense but *uses a sentient thing*. And since these statements are inadmissible, it is impossible that there be in us three souls differing in substance, the intellective, the sensitive, and the nutritive." (S. Thomas [82] p. 144).

If the primary temperament helps the breath to receive the primary faculty, then the vital powers, the breath and the faculties are its perfection. The primary vital faculty is not sufficient by itself to enable the breath to respond to the other faculties, but needs an appropriate temperament first. The physicians also claim that this faculty, besides paving the way for "life," itself initiates the movement of the attenuated spiritual substance (the breath, that is) towards the various members (organs), and is the agent which brings about the contraction and expansion of respiration and pulse. In that it assists life it is "passion"; in that it assists the activity and functions of mind and pulse it is "action."

166. The vital faculty resembles the natural faculties in that its actions are beyond the scope of the will. It resembles the animal (sensitive) faculties in carrying out contrary actions—namely, it dilates and contracts at one and the same time, effecting two contrary movements at once.

167. The diverse use of these terms in philosophy and medicine.—When the ancients use the word "soul" (nafs), they refer to the earthly or corporeal soul, the perfection of the corporeal body, which is its instrument; the source of all those faculties upon which the movements and various bodily operations depend. The natural faculty, in *medicine*, thus corresponds to the "animal" faculty in philosophy. The soul (nafs) is not understood in this sense but is "the power which originates understanding and voluntary movement." The natural faculty, in *philosophy*, means "every faculty from which any bodily function proceeds." But this is not the "animal faculty" of medicine but a natural faculty of a higher order than that named "natural" in medicine. So, if natural faculty is defined as "that which is concerned in nutrition whether for the preservation of the individual or of the race," then another, and third term would be required to represent this other faculty. Anger, fear, and similar emotions are passions of this same faculty, and admittedly arise from the senses, the judgment and the apprehensive faculties.

The proof of the existence of this third faculty, and of its being single or multiple, is a question for natural science, which is part of philosophy.

Expressed in another form,—

Term in Philosophy	Corporeal Soul (= lower reason)	Natural Faculty	Animal Faculty
Corresponding term in Medicine	Animal Faculty	(Higher) natural Faculty	Natural Faculty
Scope of term	Seat of movement, action, operations	Seat of passions and starting point of 'apprehension.'	Vegetative Functions

The important subject of the "breath" needs further elucidation at this point. The continuity of the "Canon" is therefore here interrupted by introducing the opening passage of "De viribus cordis," and an explanatory extension.

THE BREATH

Its Origin, Forms, Sources, and Relation to the Being

168. I. THE ORIGIN OF THE BREATH.

ALLAH created the left side of the heart, and made it hollow in order that it should serve both as a storehouse of the breath and as the seat of manufacture of the breath. He also created the breath to enable the faculties of the "soul" to be conveyed into the corresponding members. In the first place the breath was to be the rallying-point for the faculties of the soul, and in the second place it was to be an emanation into the various members and tissues of the body (whereby these could manifest the functions of those faculties).

169. Now He produced the breath out of the finer particles of the humours, and out of igneity ; and at the same time produced the tissues themselves (the visible body) out of the coarser and terrene particles of these humours. In other words, the breath is related to the attenuated particles as the body is related to the coarser particles of the same humours. Just as the humours are intermingled to produce a temperamental "form," whereby the members of the body are enabled to receive a physical appearance, impossible were they separate ; so the attenuated portions of the humours, being intermingled into a temperamental form, enable the breath to receive the powers of the soul—impossible were the humours separate.

170. The beginning of the breath is as a divine emanation from potentiality to actuality proceeding without intermission or stint until the form (lit. preparation, state) is completed and perfected. Each member, though derived from the self-same substance of the humours, nevertheless has its own particular temperament—for the proportional quantities of the (denser portions of the) humours and the form of their commixture are peculiar to each member. Similarly, although derived from the same attenuated portions of the humours, nevertheless each of the three breaths (natural, animal and vital) has its own particular temperament, for the proportional quantities of the more attenuated portions of the humours, and the manner of their commixture are peculiar to each breath.

171. Although the body consists of several members, there is one from which they all originally arose. As to what this member actually was, there are various opinions. The fact remains that one member necessarily came to light before other members could arise out of it. Exactly the same is true in the case of the breaths. There is one single breath which accounts for the origin of the others ; and this breath, according to the most important philosophers, arises in the heart, passes thence into the principal centres of the body, lingering in them long enough to enable them to impart to it their respective temperamental properties. Lingering in the cerebrum it receives a temperament whereby it is capable of receiving the faculties of sensation and movement (sensitive faculties); in the liver, it receives the faculty of nutrition and growth (vegetative faculties) ; in the generative glands it acquires a temperament which prepares it for receiving the faculty of generation (reproduction).

172. The foundation or beginning of all these faculties is traceable to the heart, as is agreed upon even by those philosophers who think that the source of visual, auditory and gustatory power lies in the brain.

173. Some philosophers consider that the breath is made able to receive these faculties, and so be perfected, in other members (than those named). Thus, visual power results from the union of the temperament of the breath with the moist temperament of the crystalline lens ; that the auditory power results from the union thereof with the temperament of the auditory nerve ; that gustatory power is produced by the mediation of the moist temperament afforded by the soft spongy sub-lingual glands.

Others reject this view and consider that the breath carries the faculties from the brain, and receives nothing from the temperament of the member to which it travels, as nothing is necessary to perfect it. The member itself is an instrument well adapted for the action of the vegetative faculty, and contributes nothing of its own essence.

Other philosophers have claimed that the breath acquires all its powers in the heart, emerging therefrom in a state of perfection ; hence the liver and brain do not add to it.

However, a careful enquiry into the truth shows that all such views are untenable. The only possible view is that the breath obtains the perfection of the given faculty in that member which is the instrument of such faculty.

The continuation of the translation of *De viribus cordis* is resumed at **1053**.

Explanatory Extension of the Subject of “The Breath.”

§ 136. *Synonyms.*—“The breath of life” (Gen. 2.7 ; Quran 32-9) Souffle de vie ; Ruach (Heb.) ; Ruḥ (Persian, Arabic) ; Hu (Sufi) ; Ch‘i (Chinese) ; Prana (Hindu)* ; Hauch (German) ; Spirit (as a translation of “spiritus,” for which “breath” is the better equivalent : see § 134, and § 129, footnote ; spiritus is the Latin translation of the Arabic nafs).

Primordial aura (Bruce,[11] p. 101) ; “ether” ; vivifying principle ; vital fluid ; vital (cosmic) force.

Definition : that which binds the vegetative and sensitive life into one connected whole. It is common to, and like in, *all* living things.

“That which centres in the cardio-pulmonary centre.”(Baraduc.[110])

“It is a subtle vapour which rises from the blood, diffuses itself to the remotest arteries, and resembles the sun in luminosity. (Ch. M.[7] p. 8.)

Negative definition.—“Breath” is *not* “respiration,” “breathing,” drawing in breath. Therefore it is not the equivalent of anhelitus, nafas, anfas, Atem.

The expression “he breathed his last” actually describes the departure of the “breath,” but there are two events taking place simultaneously, and the literal respiration is only one of them.

It is *not* “soul”=anima. The latter is the Latin translation of the Arabic ruḥ in various passages.

It is *not* “vitality,” for this is the manifestation of breath.

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* The Hindu system of physiology recognises five breaths as supporting the body. They are : Prana (the air inhaled), Apana (has a downward course), Samana (essential to digestion), Udana (has an upward course, or passes into the head), Vyana (pervades the whole body and moves in various directions, transverse and otherwise ; therefore, equivalent to the “breath” of the present section.) But Prana includes the rest, ordinarily speaking.—E. A. C., Kaviratna, Charaka Samhita, ii. 20.

Vitality stands for the vegetative soul. Thus, enfeebled vitality means lessening of the ability of the vegetative soul to accomplish some or all of its faculties.—Therefore it is *not* " life." (" Allah made life to be in breath." Night 913, Burton, [104] v. 422).—It is not the " vital air " of the 18th century chemists. It is not even " vital faculty." It is not amenable to either physical or chemical methods of investigation. It is not a force at all, and therefore not analogous to electricity, magnetism, heat, etc, though in the course of its activity it manifests all such phenomena.

Breath is *not* " individuality."

Description by analogy. Being immaterial, and representing a notion foreign to Western thought, breath is almost indefinable, whereas to the Eastern mind there seems little difficulty in the conception. Analogies—such as to flame, a pendulum, a ladder or lift to a higher plane of being, a chain linking the three aspects of the soul, to light, to vibrations, and so on—are necessarily misleading.

By picturing the breath as a sort of aura pervading the body, with a polarity correspondent with the cosmic ether (its source, whence it individualized into the human being), the conception of orientation (in time and space) becomes feasible. Angle of incidence is then to be considered, both in regard to every direction of space and to time of day. Thus an infinite variety of constitution in these respects becomes obvious.

§ 137.—*The substance of the breath.*—This is mentioned in several passages in the Canon. Though immaterial, the breath needs a material basis or substrate. The substance is described as twofold : (*a*) an aqueous vapour, in the case of healthy breath, as occurs when the humours—the source of the substance of the breath (**169**)—are healthy. (*b*) A fuliginous vapour, like the mist of the early morning landscape, if the breath be unhealthy—namely because superfluities are present in the humours.

A more tangible idea of the substance of the breath is furnished by taking it as partly consisting of oxygen, for the functions of oxygen in the body are the same as those attributed to the breath which it carries. Thus to quote L. S. Beale, " oxygen is necessary to disintegrate the soft formed material and combine with some of its constituents."—That is, breath$=mf$, where m is oxygen.

In the Hindu system, there are ten substrates for the life-breaths.—Charaka, i. 402.—But these are anatomical.

The " primordial substance " of Chinese philosophy, the ground of all phenomena, physical and psychical, fulfils the theory of the breath. It is invisible and intangible, but manifests as matter (solid, fluid, gaseous), as psychic existence, and as spiritual existence. This substance agrees with " breath " in showing cyclical changes, passing from energy to inertia, from activity to passivity, incorporeality to corporeality. The incorporeal is " the rule of existence implanted in every living being " ; and " Li " is the Nature implanted by the Decree. This principle of activity appears in modernist philosophy as " mind." (Cf. Bruce,[11] p. 109.)

§ 138. *The constant activity of the Breath.* Were the breath not in constant activity, the body would be " dead." The activity consists of (i) changes in quality, (ii) movement from place to place. Actually, both occur simultaneously, but description would be impossible without taking each form separately.

(i) *Changes in quality.* This is a rhythmic waxing and waning in intensity ; a change from a strong phase to a weak one, and back to a strong one ; a change from positive to negative ; an ebb and flow ; a condensation or concentration (" inspissation ") and an expansion or rarefaction (attenuation "). In the one phase there is attraction of energy from without, symbolized by inhaling air ; in the other, there is repelling of energy from within, symbolized by exhaling air.

These *phases of movement* are represented by the terms jelal, jemal (Persian) ; jalal, jamal (Arabic) ; shiva, shakti (Urdu) ; Yin and Yang (Chinese);[23] masculine, feminine ; active, passive ; etc. The rise is called Urooj in Persian terminology, and the fall, Nasool ; it is a rise from no intensity (incipience) to great intensity ; there is a period of maximum intensity (maturation) and a fall from thence to no intensity (decay, defervescence, decline).

This cycle of the breath is continuous, but varies in rate—hourly, two-hourly, twice-daily, daily,* weekly, monthly, seasonal. According to its changes, so does the feeling of well-being of the person change ; according to its changes, so are there differences of bodily vigour in one and the same person. Every family, every race has its type of " breath." Wherever we turn in living Nature we can see the traces or signs of this " pulse of life "—in vegetable life, in animal life, even the greater range of human history itself, the rise and fall of nations, the rise and fall of pandemics ; the solar and planetary cycles—all show the traces of this activity, though no doubt many would consider the connection with " breath " very intangible in these instances.

The explanation of this activity. This is to be found in the fact of the cyclical changes in the imponderable elements, for the two phenomena, as already suggested, are part and parcel of the same phenomenon. Thus, breath, conceived as a vibration rate, is now slow, now quick, now coarse, now fine. The range and changes of vibration from " earth " (slow, coarse) to " ether " (quick, fine), and back, as has been intimated, are associated with changes of activity of the breath. These elements are, as it were, the *points d'appui* of the breath, and they constitute an " immaterial " circulatory-system.

§ 139.—*Relation of breath to temperament and the emotional character.*—So close is the relation between " breath," " imponderable elements " and " temperament " that description of the one readily lends itself to being a description of one or both the others. If we trace changes in " earth," " water," etc., we are at the same time tracing changes in the activity of the " breath," and we use words which apply to both " temperament " of the old sense, and emotional character as spoken of to-day. Dominance of " water " is as much as to say "the breath remains in the 'water' phase over a longer period of time than in other phases—in this person." It also goes with "jemal" type of character, the exact form of manifestation varying according to other factors in the "make up"—e.g., quiet endurance, silent submission to pain, ardour of æsthetic emotion, keen sense of beauty, love of certain kinds of music, certain colours, flowers, etc. (Note, then, how intimate *this idea* of "constitution" becomes.)

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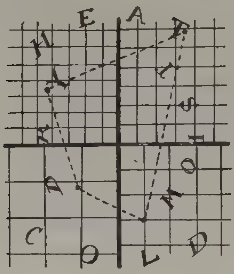
* Chloride-retention has a cycle of three or four days (Vallery-Radot [141] p. 308).

The construction of a graph to represent possible variations may be helpful, as long as its essentially schematic character is realized.



The dotted area represents the supposed temperament used in the sense of **26**, sqq. If it were ideal, it would be an exact square.

Note the necessity for four scales. Reflection on this diagram, in the light of the text, should bring out many points which otherwise require lengthy description. Strictly, no doubt, the diagram would be improved if it could be conceived in "solid form."

Diagram of a Person's Temperament.

To give another illustration—dominance of "fire." The following are its modes: (1) the vibration-rate of the "breath" remains longer in the "fiery" phase than in other phases and in other persons*; or, weeks elapse before it reaches its climax (kemal stage); (2) the temperament is "fiery,"; (3) the person is called "of hasty disposition," "hot-tempered," he is "prone to anger"; (4) the climax of the fire-element may be reached suddenly: e.g., persons of "explosive" temperament or disposition; the blood "boils"; (5) the associated character is of jelal type, taking different forms according to the manner in which the patient reacts to the circumstances of life: e.g. (*a*) possession of great physical strength, (*b*) pugilistic power, (*c*) courageous in danger, (*d*) irascible character, (*e*) originality of thought, (*f*) ambition, (*g*) a person with unshakable gentleness, despite opposition (e.g., in some "saints"), (*h*) proneness to enthusiastic beneficent arts, (*i*) zealous character, (*j*) cruelty of certain kinds (other cruel persons are called "cold-blooded"), (*k*) strong desire. The whole range of human activity can be drawn on for opposite examples.

So also a slow rhythm of breath goes with tranquillity of mind, and a liking for poetry and music. A moderate rhythm goes with an active mind, keen to accomplish. A quick rhythm goes with energy, forcefulness, and activity to a degree liable to lead to confusion of mind and premature exhaustion of the body.

§ 140. *Relation of quality of breath to will-power.* The will-power should dominate the breath. But it cannot do so consciously if the individual is ignorant of the existence of "breath"; persons of vigorous will-power will dominate it unconsciously. It would be easy to see that dominance of will-power by the breath should be very common, with the corollary that actions supposed to be initiated by the personality are really quasi-automatic.

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* The "ira" type, where "ira" is not simply the passion (anger), but a definite jelal-type.

The will-power may be used to "develop the breath"; that is, the way the breath flows through the body, through the various (nerve) centres.

§ 141. (*b*) *Relation to "innate heat.*" The subject of innate heat is very prominent in the pages of the Qanun; it is closely linked with "vitality" (popular sense of the word) (e.g., "enfeebled vitality," "has very little vitality"; "full of 'vim'"). The close relation to "breath" is expressed by saying that as the breath wanes (nasool phase), the innate heat lessens; as the innate heat is restored in the course of nutritive processes, so the breath "waxes" (urooj phase). The rate of waxing and waning of the innate heat varies with the individual and shows a relation with the similar phases of activity of the breath. Innate heat is expended simultaneously with "breath," and at the same time comes that indefinable phenomenon—real enough nevertheless—called "atmosphere," "personality," "radiance," "aura."

This subject bears on the theory regarding the appearance of pathological changes in the humours. Normally, the innate heat is the agent which separates normal effete matters from healthy humours. But in disease—that is, when the cycle of the breath is not in harmony with the process of formation of the humours—injurious effete matters (acrid, corrosive, etc.) appear as by-products of the abnormal humoral state; the latter being the result either of a change in the innate heat or of a conflict between this and "foreign heat" (i.e. bacterial products: **485**: § 283).

§ 142. (*c*) *Relation to metabolic changes* spoken of (§ 83) under the picturesque title "dance of the elements." The picture of imponderable elements dipping down into the world of ponderable elements (or, to be precise, the individual human being), and entering into the changes of metabolism expressed as changes of pivot of function from C to O, or H, or N, or S, or P in compound after compound, and break-down into CO_2 or H_2O, etc, or as formation of tissue cells and their subsequent necrobiosis, etc.—all this is completed by the view of the breath, passing from phase to phase, from strong to weak, not merely in one organ, but in every particle of the whole being. With the ascending phase of the breath come the formation of increasingly complex substances,—"*generatio*"; with the descending phase, goes the disintegration into simpler substances—"*corruptio.*" Viewed as life-principle, we may think of the breath as controlling the vegetative faculties of the soul, which are associated by an intimate mutual relationship.

In this connection, the observation may be here noted that change of electric potential arising from the metabolism of the salts is necessary to the formation of *active* (as opposed to inert) fat in the body.

Hence physiological action—that is, anatomy in motion—is not merely a question of the behaviour of C, H, O, N, S, P, in the various side-chains, etc. It is a sum of potentialities possessed by the separate imponderables and by their varying combinations, in the particular individual at any given time. The common denominator or collective formula which represents this sum adequately is necessarily very complex, and yet it is really essential that it be elucidated before one could be said truly to grasp the real basis of a person's ill-health, or intelligently work out the fundamental bases of prognosis.

§ 143. (ii) *The activity of movement.*—The second mode of activity of the breath consists of a cyclical movement, *a movement in place*, a movement comparable with a circulation. During the course of this movement, the breath comes successively into relation with the several tissues and organs, one after the other until it reappears at the starting-point.

The movement may be anti-clockwise as well as clockwise in the various parts of the body.

But there are two paradoxes here. Firstly, there is no period of time when the breath can be said to have passed a given point. It is not like an object going round and round, like e.g., an imaginary drop of blood. The breath is all through the body all the time. It is more as if there were a series of lights in an electric circuit, and they burning the whole time, but the intensity is changing successively from point to point. The breath is always in the great centres of the body (the " chakras, pranas "), but it is brightest in the liver at one moment, and the brain at the next and so on—yet following a certain order.*

§ 144. Secondly, the circulation has no anatomical boundaries.† Not only this, but it is flowing left-sidedly or right-sidedly. This is transparently non-anatomical. Many would reject the possibility and even an attempt at proof would be unsatisfying. The justification for the statement that the breath is now left-sided, now right-sided, flowing down each side separately, depends on subtle observations which are beyond the scope proposed for this work. It will suffice to suggest just this: the peculiar attitudes adopted by all creatures (animals as well as men) during sleep; when standing or sitting; when exercising or at repose; also the different moods shown by a given individual—these and similar phenomena, carefully watched, furnish adequate indications of the truth of the statement. There is also a circulation along such intangible " channels " as the temperaments of the organs.

§ 145. However, there is an actual *relation to anatomical organs* as well. There is no ambiguity about this. The passage of the breath from liver to brain, from heart to tissues is orderly, and deliberately specified not only in the Qanun but in the De viribus cordis, lest the unwary should be misled by the faulty ideas of Avicenna's predecessors and contemporaries. The heart as the centre of life, and the seat of formation of the breath, is no mere fancy. To speak of the flow of the breath through the major organs " awakening " each " centre " in turn (cerebral, thoracic, digestive, genital) and then necessarily reaching the lesser organs (including the tissues and cellular elements) is to give a true picture of life. To insist also that in meeting the "centres" the breath is altered; that it receives ; and then proceeds in that altered or renewed form to the lesser tissues, is to fulfil the great law—the law of giving and receiving ; both together ; simultaneous ; balanced in degree. Both are true. To omit one is to speak inaccurately because one represents only in part.

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* This was realized also by the Chinese physicians as shown in the Classic on the Pulse (vol. lxxx, p. 28)

† Possibly this idea underlies the seemingly impossible Chinese statement: "the blood is inside the vessels, the 'spirits' outside."

§ 146. *Application to physiological histology.*—As has been suggested, physiological histology is microscopic anatomy in motion. It is the blackboard on which can be demonstrated the reality of the truths of the scholastic conceptions. So, in studying the tissues microscopically we must remember to introduce the conception of the flow of the breath through the tissue-spaces, the juice-canals, which are also the channels of the breath. Synchronous with this flow there is an attenuation of cell-substance into fluids ; and a disintegration of complex chemical substances into simpler ones. At the same time, one must say " the change in the breath *is* attenuation and aggregation of such substances."

Substances pass from the colloid to the fluid state ; from the colloid to the crystalloid state ; from complex to simple ; and *vice versa*. They pass by aggregation from fluids into cell-substance (" assimilation "). It is all one single process. That which we see with the aid of the microscope is the " visible " manifestation of cyclical changes in atom-groups, of carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, etc. The excrescence which we can see on the nuclear contour of the leucocytes, for instance, *is* this dominance of the several chemical elements—whether the change be the outcome of " attenuation " or of " aggregation." Not only this, but the excrescence of the nucleus is also the effect of the change in the breath which at different times belongs to different chemical elements, and so to different morphological histological appearances.

The conception of the blood-forming centres as the meeting-point of two vitalities has already been suggested (§ 121).

§ 147. *Application of the conception to pathology.* (*a*) Disease as the result of *interference with the freedom of flow* of breath, not only round the body, but also away from the body altogether.—It is clear that an actual obstruction in a tissue (whether it can be seen with the naked eye, or felt with the hand, or whether it is in so minute a channel that the microscope is needed to demonstrate it) prevents the flow of tissue-fluids and is the forerunner of a morbid condition—a " disease." But it exerts this effect primarily because *the flow of the breath is obstructed* and its rhythm degraded. Could the two series of events occur independently, the fact is that the former, the material obstruction, would not suffice to set up such a morbid condition.

The following are useful concrete examples of diseases produced in this way :

The dire effects produced by hysterectomy in young persons, once in much vogue for instance for severe dysmenorrhœa; and the persistent ill-health which appears when it is done in older persons round the prime of (child-bearing) life. The explanation is to be found in the destruction of the "channels" of the breath—the severance of non-medullated nerve-fibres, and even the actual removal of important nerve-ganglia. This indefinable vital component of the being, which must "circulate," goes so far, and then finds a void, and its activity is turned back on itself; there is a revulsion; and the patient is aware of a great distress which nothing will (or can) relieve.

(ii) Jejunal ulcer following gastro-enterostomy, or excision of gastric ulcer.

(*b*) Disease as a result of *disturbance in the rhythm* of the breath. A change of rhythm, or an ataxy of the breath, would suffice to initiate a loss of immunity to bacterial agents. Since there must also be an outflow of breath, any associated interference with its current would have the effect of holding back any of the isolated micro-organisms which are always to be found in the tissues.*

In this way the organisms would have time to develop into active colonies. Structural organic changes then appear in the body.

When Paracelsus said that "life-principle may decompose and become a strong poison, furnishing life to innumerable, invisible (i.e., microscopic) existences, by which infectious diseases are caused," he was not speaking foolishly.[29] (p. 155).

(*c*) *Loss of balance* between the normal qualities of the breath and the functions of the body may initiate disease.

(*d*) The *relation between the intracorporeal cycles* of the breath *and the cycles in the outer world* is a factor for consideration in regard to the study of bacterial cycles in Nature, outside the bodies of animals and other human beings.

(*e*) Sudden *recovery from incurable diseases* should be intelligible in view of the nature of the breath. Remembering the existence of polarity, and a point of penetration into the corporeal being, and considering the fact that in disease there is a distortion of the "shape" of the breath, it is not difficult to conceive that some outer force or power breaks through and restores the polarity to normal, in which event the sick person would be once more in proper relation to his terrestrial conditions, and be freed from the interference (analogous to the interference of light) which has previously occurred in the activity of the breath. The event of such a revulsion occurring at all, whether the subsequent physical recovery be instant or only reached by gradual stages, would bring the case within the category of miraculous cure.

§ 148.—*Changes of quality of activity of the breath are simultaneous with its movement from place to place within the body.*—The two aspects of the activity of the breath must be considered simultaneously, for they are not actually separate. Thus, to sum up, we picture the breath circulating from nutritive organs to those of the sensitive life, awakening as it does so the lower passions (the nutritive=" appetite"; the reproductive = " desire": see § 160; and then the higher (the emotions, the " atmosphere," the " inspiration"). The faculties of each organ are " activated" as the breath traverses them; their vitality augments, and the breath itself concurrently receives something from each " centre." The " natural" breath is the phase, then, when the breath is considered in regard to the natural or vegetative processes of the body, and is " located" in the liver, and is associated with venous blood. The " vital" breath is the phase when it is located in the heart, and is associated with arterial blood. The " animal" (or sensitive) breath is associated with the nerve-fibres. Yet there are not three breaths, but one breath—" not three souls but one soul." And the " breath" is *not* the " soul."

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* This fact was again called attention to recently by Sir Charles Ballance. (October, 1929; *Lancet*, 1929, 324.)

The changing activities of breath are associated with changes in the composition in regard to the cosmic elements; with changes in chemical composition. Movement of quality (type, rate, primary quality) goes with movement in regard to place.

The expressions " a matter-of-fact person"; an " emotional person"; a " neurotic person," in the light of the considerations presented at such length, are seen to be capable of interpretation in terms of corresponding types of " breath," which are dominant in the given individual (§ 138).

§ 149. All these changes have been analogized with a "dance." The breath is the controller of both aspects of the dance. It is the music of the dance which holds the dancers together. When the music ceases the dance ceases, or degrades into a meaningless disorder. And the ceasing of the dance is 'death'; and the degradation is the subsequent decomposition processes.

The player of the music, and the movements of the two dancers should blend harmoniously to make the perfect dance. What if there be inattention on the player's part? What if he should not correspond to the capacities and capabilities of the dancers? What if the giving and receiving between the music and the dancers should fail at any moment? Surely, then there is disease. Whatever modern medicine has to say about etiology, this fact remains at the root of the phenomena of all disease. In health, the dancers depend on the player, and their dance is so perfect that they always respond to his tune. But there comes the time when the (hidden!) Improvisor of the music cries out " Halt!"

§ 150.—The following repetition of some of the important facts so far discussed is justifiable for still greater precision.

Abbreviations : *a*, animal ; *b*, breath ; *B*, body as a whole ; *C*, vital centres (heart, liver, brain, gonad) ; *f*, faculty ; *h*, heart ; *j*, vegetative ; *l*, "life" ; *L*, life-principle ; *m*, mind ; *n*, natural ; *r*, rational ; *s*, sensitive or sentient, or sensuous ; *S*, soul in the Platonic sense ; *sp.*, spirit. *v*, vital.

(a) General Statements :—

L exhibits *jf*, *sf*, *rf*, and *vf*.
But *L* is not the same as *jf*, *sf*, *rf*, and *vf* ; or the same as (*j.s.*) *l*.
L is not $= jf+sf+rf+vf$.
L is not the same as *S*.
S is not the same as *L* ; or *m* ; or *sp*.
S includes *L*, *b*, *jl*, *sl*, *rl*, *vf*.
b is not *l*, or *L*, though *almost* equivalent to *l*.
l implies *b*.
af (Avicenna) belongs within the domain of *sf* and *rf* (scholastic).
jl (scholastic) comprises *vf* and *nf* together (Avicenna).
sl (scholastic) comprises *vf*, *nf*, and *some af* (Avicenna).
sl (scholastic) is equivalent to *nf*. *vf*. (*af*—*rf*) (Avicenna).
rl (scholastic) comprises *vf*, *nf*, *af* (Avicenna).
rl (scholastic) includes *jl* and *sl* (scholastic).

(b) Special Statements.

(i) The three chief views of the nature of a "person" are :

Modernist, or scientific or rational :	$B+m$.
Popular or Platonic.	*S* and *B*, or $S+B$.
Aristotelian.	*S.B.*, or $S \times B$.

(ii) *The scholastic view* may be thus expressed :

"Nature" is *L.B.* ; the "vegetable nature" is *jl.B* ; the "animal nature" is *jl.sl.B* ; "human nature" is *jl. sl. rl. B*.

(iii) Comparing the description given by Avicenna, with that given by S. Thomas, we have :

Avicenna	(*b*, *nf*, *af*), B (C)
S. Thomas	*L.B* ; or (*jl*, *sl*, *rl*) *B*

* * *

Psychology

5. THE ANIMAL FACULTIES (SENSITIVE LIFE)

174. The animal faculties comprise those of (*a*) perception (*b*) locomotion. The former comprises (i) external senses, (ii) interior senses. Each of these exhibit five faculties.

" Now the ' Perceptive faculty ' (Mudrika) is subdivided into ten branches, five of which are called the ' External Senses,' and five the ' Internal Senses.' The former are Touch, Taste, Sight, Hearing, and Smell."—(Ch. M.[7])

These faculties may be also designated faculties of the lower mind, or lower reason.

" Augustine says that the higher reason is that which is intent on the contemplation and consultation of things eternal . . . but he calls the lower reason that which is intent on the disposal of temporal things. Now these two—namely, eternal and temporal—are related to our knowledge in this way, that one of them is the means of knowing the other." ([84] p. 112).—The whole subject is to be found treated in a masterly manner in this and adjoining sections of that work.

175. A division of external senses into eight is obtained by regarding " touch " as including four senses in itself, for this is performed by more than one organ. Thus the tongue not only tastes but has a sense of touch. This view follows the philosopher.

These senses are not further discussed in the Canon. The following quotation from Chahar Maqala (E. G. Browne's translation[7]) may be therefore added.

" *Hearing* is a sense located in the nerve which is distributed about the auditory meatus, so that it detects any sound, which is discharged against it by undulations of the air compressed between two impinging bodies, that is to say, two bodies striking against one another, by the impact of which the air is thrown into waves and becomes the cause of sound, in that it imparts movement to the air which is stationary in the auditory meatus, comes into contact with it, reaches this nerve, and gives rise to the sensation of hearing.—*Sight* is a faculty located in the optic nerve which discerns images projected on the crystalline humour, whether of figures or solid bodies, variously coloured, through the medium of a translucent substance which extends from it to the surfaces of reflecting bodies.—*Smell* is a faculty located in a protuberance situated in the fore part of the brain, and resembling the nipple o the female breast, which apprehends what the air inhaled brings to it of odours mingled with the vapours wafted by air-currents, or impressed upon it by diffusion from the odorific body." It is really a very delicate kind of *taste*. The sense of *taste* detects soluble nutriments in those objects which come in contact with the tongue, discriminating between sweet, bitter, sharp, sour, etc. The sense of *touch* is distributed throughout the skin and flesh of the animal, the nerves thereby perceiving and discerning anything which comes in contact with them—such as the four primary qualities: dryness, moisture, heat and cold; and the secondary qualities of roughness, smoothness, harshness, softness.

The five sounds, the five tastes, the five colours, are simply manifestations of the five elements (cf. Forks[28], p. 238). " Your taste, your seeing, your hearing, etc.—these are the elements; so say not they exist not ! "

176. THE INTERIOR SENSES.—

There are five groups of interior faculties : the composite, the imagination, the apprehensive or instinct, the retentive or memory, and the ratiocinative. The first two are taken together by the physician, but not by the philosopher.

177. *The Composite sense* (= *Common sense:* Hiss-i-mushtarik) is that which receives all forms and images perceived by the external senses, and combines them (into one common mental picture).

Site: Anterior Ventricle of Brain (Ch. M.)

The sensations of sight, smell, touch, afforded by an object are conjoined, and the qualities perceived by the different senses become gathered into one single percept. This faculty exists in virtue of the fact that all sensation and muscular action are two aspects of one process. With the exercise of every sense-organ there goes an exercise of muscular action, and the latter cannot occur without at the same time arousing muscular sensations, because sense-organs for muscular senses are everywhere present along the fibres of which the muscles are composed.

178. *Imagination.*—(*Phantasy.*) This preserves the percepts of the composite sense after they have been so conjoined, and holds them after the sense-impressions have subsided. The common sense is the recipient and the imagination is the preserver. The proof of this belongs to the philosopher.

The chief seat of the activities of these two faculties is the anterior part of the brain.

§ 151. Regarded from the scholastic point of view, the imagination may be distinguished into (*a*) *sensuous*, (*b*) *rational*, or *intellectual* The former is equivalent to Avicenna's term, for it concerns itself with natural objects. The second form is concerned with ideas, is creative or productive, and manifested as "invention" (artistic, mechanical, scientific, etc), whereas sensuous imagination is simply reproductive. But in both cases the faculty is defined as "the power of forming mental images or representations ("phantasms") of material objects *apart from the presence of the latter*" (Maher, p. 163).

Source of the images: (*a*) the sensations, emotions and actions of the body; (*b*) trains of thought, which are chiefly on the higher plane of rational life; (*c*) the intellect; (*d*) other external influences, such as other minds, whether human or angelic.

The difference from "common sense" is that the latter only deals with objects *while present.*

179. *The Cogitative Faculty.*—The faculty which medicine calls cogitative is taken in two senses in philosophy. It is regarded sometimes as "imaginative faculty" [*mutakhayyal:* animal] and sometimes as "cogitative faculty" [*mutafakkira:* human].

In the view of the philosopher, the former is where the apprehensive faculty (q.v.) comes into play, and the latter is where reason controls or decides that a given action is advantageous. There is also the difference that the imagination deals with sense-form percepts, whereas the cogitation uses the percepts which have been stored in the imagination and then proceeds to combine and analyse them, and construct quite different images : e.g. a flying man, an emerald mountain. The imagination does not present to you anything but what it has already received through the sense-organs. (*p.*)

The seat of this faculty is in the mid-portion of the brain.

It combines or separates, as the mind selects, those particular percepts which are stored in the imagination.

It is clearer to place the cogitative faculty into the higher " plane " of rational life. It really belongs partly to the intellectual imagination, and partly to the rational faculty, the understanding.

180. *The apprehensive faculty.*—This faculty is the instrument of the power called *instinct* in animals. ("*Animal prudence.*") By it, for instance an animal knows that a wolf is an enemy, and the kid distinguishes its dam as a friend from whom he need not flee.* Such a decision is not formed by the reasoning powers, but is another mode of apprehension. Friendship and enmity are not perceived by the senses, nor do the senses comprehend them ; and they are not perceived by the reason either. Man employs the same faculty on very many occasions exactly as does an irrational animal.

Apprehensive faculty v. imagination.—The former executes a judgment ; the latter simply stores sense-perceptions.

Apprehensive faculty v. cogitative faculty.—The former relates to one single act ; the latter does not make a judgment, but opens the way to a series of discursive processes and decisions. The cogitative faculty is concerned with the synthesis and analysis of sense-impressions whereas the apprehensive faculty makes a judgment on the super-sensuous ideas in the particular sense-percepts. The cogitative faculty is concerned with forms perceived by the senses ; the apprehensive faculty deals with derivatives therefrom ("suprasensuous forms.")

¶ Some writers however call the apprehensive faculty " cogitative " as a matter of convenience, saying that the terms are unimportant as long as one understands the things themselves and the primary differences between them.

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*Or, as a child distinguishes between a spotted rope and a serpent, and discovers the suprasensual ideas existing in particular percepts. (Ch. M.[7]).

§ 152. Clearly, the apprehensive faculty of the text covers both "lower reason" and "reason" as ordinarily understood. The former is also called "instinct." The difference between the two is easily defined in theory, but difficult to apply in practice. Instinct is "the sense of what makes for the well-being of the individual." "Concrete relations are perceived without an abstract conception being formed. Instinct therefore differs from reason in the *absence of abstract universal knowledge*. At either end of the scale, the external manifestations are clear and absolute."[50]

§153. Instinctive actions may be described as highly complex reflexes, the movements being spread over a (variably) long time-period, and appearing after a (variably) long interval. Thus we have:

(*a*) sensory stimulus—>lower nerve-centres—>immediate reflex movement;
(*b*) the stimulus of a perception—>higher nerve-centres—>a series of complex movements.

(*a*) need never reach consciousness; (*b*) goes on without a consciousness *of the general* (not "particular") *end or purpose* of the movements.

While the subject of instinct is always discussed in regard to the actions of animals, it should be admitted that nine-tenths of our daily actions really belong exactly to the same plane or order. The use of the expression "lower reason" enables a vast number of particular instances of animal behaviour to be classified along with many similar actions performed by man, perhaps especially during childhood.

Much of the difficulty about instinct versus reason in animals is avoided in this way. It is also to be noted that while speech and language exist in various orders of creatures, *articulate* speech occurs in man alone (Bock[114]). Animals can express their own emotions to one another, and can understand our speech in that it conveys emotion. But that is different from the reasoning processes which scholastic philosophy limits to man.

181. The apprehensive faculty need not be considered much by the physician because disorders in it are always consequent on disorders in the prior faculties of imagination, and memory, as we shall show later on. It is only necessary to consider those faculties the disturbances of whose functions bring on disease. It is enough to know that the lesions in one which are interfering with the other arise in the temperamental state of the member or in depravity of its constitution. For on this knowledge depends the selection of the remedy and how to guard against the disease. Not to know about the state of a faculty which is affected only indirectly is of less moment compared with accurate knowledge about a faculty which is affected directly.

182. *The Retentive Faculty. Memory* (*Ḥafiẓa*, *Dhakira*). The power of memory is as it were a treasury or repository for those supra-sensuous ideas discovered by the apprehensive faculty, just as the imagination is the treasury or repository for the sense-impressions of forms and sensible images (formed by the common sense). The seat of this faculty is in the posterior region of the brain.

The philosopher discusses whether apprehension and memory are to be taken together or separately. Is apprehension merely a treasury of reflection? To the physician this problem is irrelevant because the same noxa, be it an intemperament or a depraved constitution, would affect both and in either case the seat of disease would be in the same region of the brain.

The apprehensive faculty : memory : : common sense : imagination. But the composite sense preserves forms, and memory preserves ideas—the ideas discovered by judgment (Wahm). (Ch.M.[7]).

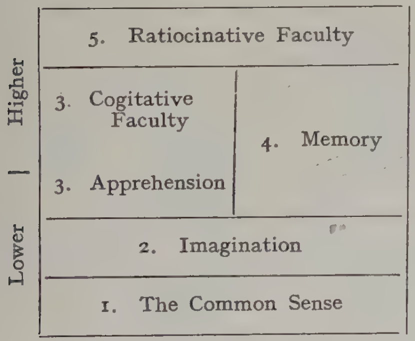
§ 154. In scholastic philosophy, the memory is two-fold—sensuous and rational. *Sensuous memory* is the power of retaining, reproducing and recognizing the representations of past experiences, and of referring an event to its place in time. The concrete objects of memory under this category are: memory of size, form, position, weight, sounds, rhythm, scent, colour, faces, persons and of certain events. The degree of capacity for memory in regard to each of these varies widely, producing various "types," such as auditory, visual, motor, etc.

The memory of emotional states is called "affective" memory.

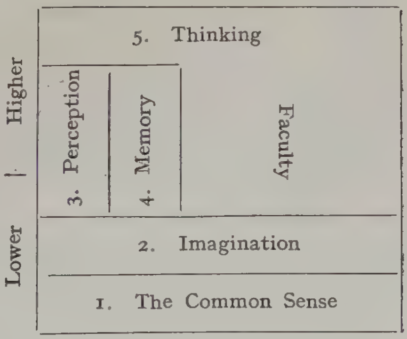
Rational memory, the power of recollection, reminiscence, the power of active recall, volitional memory.—This is restricted to man (Maher,[50] p. 180).

183. There is still one more faculty distinguishable in the mind, namely, the ratiocinative; the understanding. Physicians do not concern themselves with this any more than they do with the cogitative faculty, and for the same reason. They only study the operations of the four other faculties.

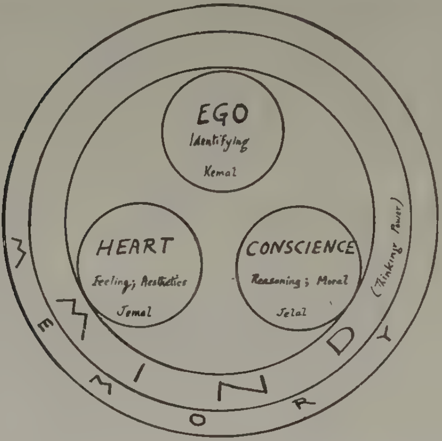
§ 155. Charts devised in order to co-ordinate various terminologies applied to the sensitive and rational faculties.


Higher
Lower
5. Ratiocinative Faculty
3. Cogitative Faculty
3. Apprehension
4. Memory
2. Imagination
1. The Common Sense

I. Avicenna.


Higher
Lower
5. Thinking
3. Perception
4. Memory
Faculty
2. Imagination
1. The Common Sense

II. Arabic (Nt. 449).


EGO
Identifying
Kemal
HEART
Feeling; Aesthetics
Jemal
CONSCIENCE
Reasoning; Moral
Jelal
(Thinking Power)
MEMORY
MIND

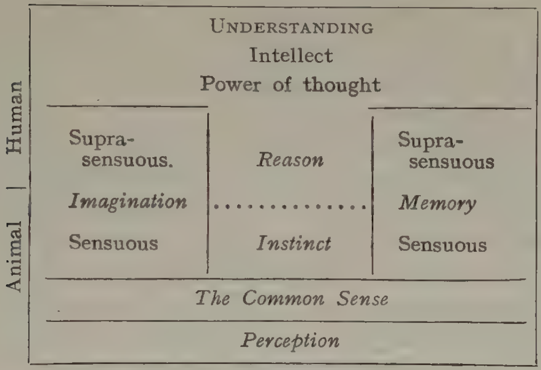
III. (Modern) SUFI[99]

<table>
<tr><td colspan="5">Thought (of God)</td></tr>
<tr><td colspan="5">Heart: sirr; qalb; ruḥ</td></tr>
<tr><td colspan="4">Intelligence (ᶜaql)</td><td rowspan="2">Higher Will;
Attention
Hamm</td></tr>
<tr><td>Reason; logical faculty
"The blamer."</td><td>Judgment
"The Watcher"
Wahm</td><td>Reflection
Cogitative faculty
Fikr</td><td>Intuition</td></tr>
<tr><td rowspan="2">Perception</td><td>Phantasy
Khayal
Imagination
Muṣawwira</td><td colspan="2">Memory
(of ideas)
Dhakira
Memory
Ḥafiẓa</td><td>Lower
Will
Nafs</td></tr>
<tr><td colspan="4">Perception
Mudrika</td></tr>
</table>

IV. JILI[62] (p. 110)

<table>
<tr><td rowspan="7">Conscious</td><td colspan="3">Reasoning</td></tr>
<tr><td colspan="3">Insight</td></tr>
<tr><td colspan="3">Concentrating power</td></tr>
<tr><td colspan="3">Volition</td></tr>
<tr><td colspan="3">Conduct</td></tr>
<tr><td colspan="3">Ideation</td></tr>
<tr><td colspan="3">Association of Ideas</td></tr>
<tr><td rowspan="3">Subconscious</td><td>Sense-memory</td><td>Instinct</td><td>Emotion</td></tr>
<tr><td colspan="3">Perception</td></tr>
<tr><td colspan="3">Stereognosis</td></tr>
</table>

V. MODERN[133]
(Psychiatric)



VI. SCHOLASTIC[50]

NOTE.—These and innumerable other views regarding the faculties of the "mind" are partly accounted for by difference of purpose in view. In ancient medicine, everything was related to the cosmic elements; in modern medicine, anatomy is all-important. In regard to mental diseases, cortical structure (strata of types of nerve-cell) is naturally a basis of interpretation. Many modern text-books of psychology consider principles of education of the young. Moral philosophy has another object in view. Eastern mystics regarded the matter in terms of the problem of attaining elevation of the soul to God. Standard modern Catholic teaching envisages all such aspects, without making clear the links between "theoretical" faculties and the actual microscopic anatomy and histological physiology of the human body. But these links are the essential interest in this treatise, and are outlined in the special chart described and discussed in §§ 157 sqq.

6. THE POWER OF LOCOMOTION

184. This power is that which contracts and relaxes the muscles whereby the members and joints are moved, extended or flexed. This power reaches the limbs by way of the nerves and there are as many forms of power as there are of movement. Each muscle has its own peculiar purpose and it obeys the decree of the composite sense.

§ 156. That the soul is endowed with a locomotive faculty is simply an ultimate fact. Our life-long experience assures us that mind and body do interact, but *how* we cannot tell. (Maher 220).

The skeletal system is the instrument of animal life.

Movement occurs in plants, but so slowly that it was not positively discerned till recent years, and is not a "locomotion" (see § 128).

7. THE FUNCTIONS (OF THE BODY)

185. Some of the functions are carried out by one single faculty; others by two together. The former is exemplified by *digestion*, the latter by the appetite for food, where there is (1) the vegetative faculty of attraction, (2) the faculty of sensation located at the mouth of the stomach. The faculty of attraction is achieved by a contraction of the longitudinal fibres which draw the object inwards and extracts from the humours that which is required. The faculty of sensation enables the organ to be aware of the acridity of the atrabilious humour, for this it is which excites appetite. In saying that this one function is achieved by two faculties together, one relies on the fact that a nocument befalling the faculty of sensation destroys that " desire " which is called hunger and appetite. Even the need of nutriment does not account for " desire."

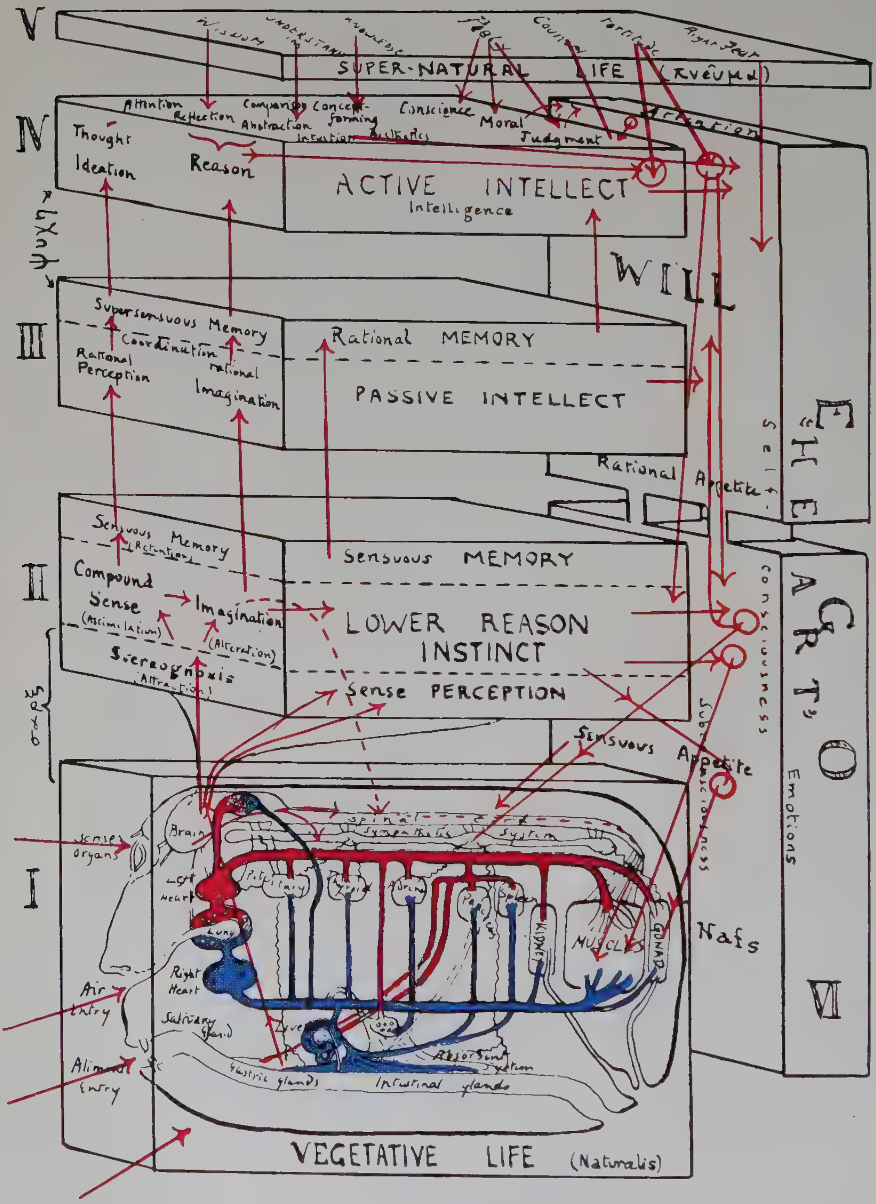
186. The function of *swallowing* is another instance of a dual faculty—that of attraction and that of propulsion. The faculty of attraction is achieved by the longitudinal fibres at the orifice of the stomach and oesophagus ; that of propulsion is achieved by the voluntary muscles of swallowing. Loss of either power renders deglutition very difficult ; even retarded activity, without actual loss, renders the act difficult. Every one knows that lack of appetite for a substance makes swallowing difficult. If a thing is repugnant, and yet we wish to swallow it, our appetite and power of attraction is so frightened away that the function of voluntary deglutition is made difficult.

187. The function of *transmission of nutriment* along the alimentary tract is achieved by the faculty of propulsion forwards of the portion containing the nutriment. It is associated with the faculty of attraction exerted by the succeeding portion.

188. The *discharge of waste matters* is also a two-fold function. Sometimes both sensitive and vegetative faculties initiate the function simultaneously.

189. In some cases a faculty is associated with a quality. Thus *cold* holds material, and also arrests the flow of humour (or intestinal contents) either absolutely by repressing its formation or relatively by driving it back. Cold restrains by (1) congealing the material (rendering its particles closely aggregated), or (2) narrowing the pores. Incidentally it has a third action—(3) that of obliterating innate heat (which is concerned with the faculty of attraction).

190. *Heat.* Heat attracts by the ways already mentioned. Heat and the urge occasioned by (relative) vacuum first attracts the attenuated matter, and later the denser matter. The vegetative faculty of attraction only attracts the things most appropriate for it, or things whose nature it is to be attracted. Consequently it might happen that the denser (more concentrated) matter, being more suitable and appropriate, and responsive, is attracted first.



V
Wisdom
Understanding
Knowledge
Piety
Counsel
Fortitude
Filial Fear
SUPER-NATURAL LIFE (πνεῦμα)
IV
Attention
Reflection
Comparison
Abstraction
Intuition
Concept-forming
Aesthetics
Conscience
Moral
Judgment
Attention
Thought
Ideation
Reason
ACTIVE INTELLECT
Intelligence
WILL
ψυχή
III
Supersensuous Memory
Coordination
Rational Perception
rational Imagination
Rational MEMORY
PASSIVE INTELLECT
Rational Appetite
Self-
“THE
II
Sensuous Memory
(Retention)
Compound Sense
(Assimilation)
Imagination
(Alteration)
Stereognosis
(Attraction)
Sensuous MEMORY
LOWER REASON
INSTINCT
Sense PERCEPTION
consciousness
ART”
EGO
σῶμα
Sensuous Appetite
Subconsciousness
Emotions
I
Sense Organs
Brain
Left Heart
Lung
Right Heart
Air Entry
Aliment Entry
Salivary gland
Liver
Pituitary
Thyroid
Adrenal
Pancreas
Spleen
KIDNEY
MUSCLES
GONAD
spinal cord
Sympathetic System
Absorbent system
Gastric glands
Intestinal glands
VEGETATIVE LIFE (Naturalis)
Nafs
VI

To face page 143

THE CORRELATION OF THE VARIOUS FACULTIES.

(Summary and extension of Thesis VI.)

§ 158. The correlation between the various faculties with the inter-connections between the visible bodily organs is usefully indicated by means of a suitable map or chart.

The following considerations are necessary in studying the accompanying map. (1) There are no actual boundaries between the faculties, even in the case of the discrete viscera. The internal senses are " merely diverse aspects or phases of a single sensuous faculty " (Maher,[50] p. 96) as Aristotle perceived. To name " departments " of the mind, it must therefore be constantly remembered, is simply to help the memory, and assist analysis of the various mental operations. (2) Subdivision of faculties into " animal " and " human " is to be avoided. (3) The enumeration of mental faculties given by phrenology is not vitiated by the fact that phrenological charts are not anatomically correct. (4) Since the strength of one faculty involves a corresponding weakness of some other, even the very existence of the faculty may be virtual.

§159. BRIEF DESCRIPTION OF THE CHART.

Six discrete " planes " are represented, and are named according to certain terms selected from those used in various classifications. The vertically placed plane serves to indicate a close relation between this and each of the horizontal ones.

Plane I.—This refers to the *vegetative life*, and shows the various organs and their inter-connections, as well as their relations to the superposed planes. Connection with the lower extremity of the vertical plane indicates the existence of " unconscious appetition " in this sphere of life. This, the so-called " natural appetite," is defined as " the inclination towards a thing which is in concord with its nature, without any knowledge of the reason why such a thing is appetible "[17] (I, 656). It is inherent in the nature of " being " on this plane.

Appetite is (*a*) natural (hunger, thirst, sleep, exercise, sex) (*b*) sensitive (reflex, instinctive), (*c*) rational. The two former depend on organic conditions, which are not regulated by reason. The sensitive appetite is under the control of the will, and can be strengthened or checked thereby.[17] (i. 656). Appetite, in the sense of sinful desire, belongs to another aspect of the subject.

Plane II.—This refers to the *sensitive life*. Sensitive life comprises the " power to know " (i.e., the faculties already discussed in **176-183** of the Canon, and shown in the charts in § 155), and the "power to love"(= "appetition" = "the power of loving that which is *the good for the individual*"=appetitive faculty = desire). The power to know is represented by Plane II and the power to love is represented by the lower part of the vertical plane. Both find their realization in organs depicted on Plane I.

"Lower" is used as equivalent to "animal" (as opposed to human). Scholastically it is the antonym of "higher." "Reason," again, is made equivalent to "instinct" because popularly the latter word is taken to be the same thing as automatism. In scholastic philosophy the phenomenon of instinct is appraised properly. Hence "lower reason" comes to be applicable for a certain series of phenonena, for that which scholastically is called instinct is that which in modern life is called "lower reason." The word reason should however be applied strictly to those higher operations which scholastics define with masterly precision.

Coincident with the mental representation of the thing—whether it be good or evil for the individual—there is an agreeable or disagreeable passive state of consciousness, and this is called an "*emotion*." Emotions are subdivided into "concupiscible" and "irascible." The former imply attraction or repulsion, and are: love, hatred; desire, abhorrence; delight, sadness. The latter concern the sense of self-preservation. They are: hope of acquiring an object which it is difficult or dangerous to obtain; despair of so doing; fear of a threatening evil or danger, with impulse to flee; courage, when there is an impulse to remain; anger.

The objects of each of these emotions are: concrete objects, whether inanimate or living; muscular activity; experience (excitement, adventure); emotion itself. For example, there may be *fear* of hunger, cold, lack of necessaries of life (clothing, etc.); of illness; of death; of punishment, of reproaches, of tears; of loss of prestige or reputation, of being misjudged or considered eccentric; fear of failure.

Planes III and IV together refer to the *rational life*. They appear separated in order to bring out the idea of active and passive intellect. They stand for: the "power to think." The vertical plane belongs with these two planes as representing "the power to will."

The power to think, or *Understanding*, is regarded as two-fold—*speculative* and practical. The former, under the influence of the will produces the act of contemplation, the object in question being purely ideal (poetry, music, art, refinement, taste). It sees resemblances, sees the "simplicity" of creation, and makes even the most thorough difference seem quite secondary and insignificant. It includes foresight, research, "wisdom." The *practical* understanding, under the influence of the will, and by the use of the physical body, accomplishes constructive work.

The power to will, or "rational appetite," precedes voluntary movement. The inclusion of the terms "attention," "consciousness," "heart," "ego," on the vertical plane, is for convenience and does not imply synonymity in every respect.

Plane V, as representing the "supernatural" life, is only introduced for completeness, and its relation with the "lower" planes, though intimate, is purposely not specified. Its necessity was perceived by Jili (taken as a representative of Islamic mysticism, by Nicholson[62]) when he discusses the "perfect" or "ideal" man, and some of its features appear in the chart representing his views (§155). The subject belongs primarily to theology.

§ 160.—DETAILS REGARDING THE EMOTIONS.

(1) It will be seen that there is no separate account of the Emotions in the Qanun. They are only referred to incidentally, except in the chapter on the Pulse (**601**) which describes the effect of five particular emotional states on the Pulse.

(2) While classification of the emotions is unsatisfactory, as Maher[50] points out, the short list given by Avicenna is convenient in practice, because every patient may be regarded as fundamentally governed by one or other, the others being relatively unimportant.

In this section such emotions as æsthetic and moral feeling are not considered. The self-regarding emotions are referred to under "Ego" (§ 164, IV).

(3) EMOTIONS AND THEIR CORRELATIONS.

	I.	II.	III.	IV.	V.
Latin name ..	Gaudium	Laetitia	Tristitia	Ira	Timor
Arabic name ..	Surūr	Lazzat	Gham	Ghaḍab	Faz‘
Chinese name ..	Hsi	Ai^{4}	Ai	Nu	Chü
Translation ..	Joy	Delight Concupiscence*	Sorrow	Anger Hatred*	Fear
Corresponding Element :					
Sufic ..	Aether	Air	Earth	Fire	Water
Chinese‡ ..	Fire	Earth	Metal	Wood	Water
Corresponding phase of breath†	Jelal	Jemal	Jemal	Jelal	Jemal
Dominant Humour corresponding	Sanguineous	Sanguineous	Atra-bilious	Bilious	Serous

(4) *Relation between the emotions and the "elements."*—There is not a strict relation between individual emotions and individual elements. As has been explained, all the elements occur together, though one may be said to be more frequently dominant than another.

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* The Chinese speak of seven chief emotions, concupiscence and hatred being the two additional ones. Instead of "delight," "liveliness," and "love" are equivalents of "ai^{4}"

† In theosophical language this relation is expressed by saying that emotions belong to the "astral" plane.[29] (p. 167).

‡ Su-Wên (Forke[23]; Wieger[144]).

The same applies to the phases of the "breath"—the degree of vitality. Every emotion goes through three phases of activity—rising, acme, falling,—as do the types of breath. Hence different words are required to describe each emotion according as it is weak, strong, balanced, pure or mixed. (See § 139, § 164, II.)

This complexity is illustrated by the following instance—the *relation between "anger" and "fire."*—"Fire varies from dull smouldering to a red-heat, and so to flame—flicker, lambient, gentle, pale, lurid, sudden flare, continued light of different degrees of intensity, fierce burning, ferocious fire. The phrases: one's blood boils, he flared up,—and so on, are graphic enough. Actually, the vessels engorge, the muscular power is intercepted, the mind becomes confused; the bile is set in motion, and may be expelled from the gall-bladder, leading to relief (bodily as well as mentally), or enters the blood more freely, engendering heat, and increasing both the acid and the bitter throughout the body. Whether a person is irascible, or is difficult to rouse to anger, whether the passion will smoulder (and hence show as a resentment, and spirit of vengeance) will depend on whether the humours are mixed or whether one or other is definitely preponderant in the resting state.

An angry person gives out a definite atmosphere, a feeling of being "on edge." The effect on bystanders depends on *their* dominant emotional state; in some it provokes quarrelsomeness, in others perplexity owing to the discovery that the person is unapproachable. Silence and appropriate interior exercises are indicated. Angry words produce mental "sores"; they may heal, or they may be kept going, or they may be re-opened, or become incurable.

An outburst of anger may be provoked by a clash of interests. These vary widely. Thus, two wills may clash; the function of one organ may clash with that of another (e.g. menstrual irritability or outbursts of temper); clash of duty with self-will. The intensity of the outburst is according to the principle of jelal-jemal.

Anger may be manifested as a "liver-storm" (variable duration), "storms" from stagnation in connective-tissue spaces (longer duration), "nerve-storms" (short duration), "mind-storms" (leading to criminal acts). These phenomena may come on unawares.

(5) *Physical effects of emotional disturbance.*—The effect of anger on bodily functions has been referred to. Fear may manifest as gastric trouble, indigestion, constipation. Panic-fear may provoke diarrhœa, and polyuria. The blood becomes flooded with toxins, and the kidneys are taxed in consequence.

The *blood-state* is altered during the sway of emotions (Cf. **1090**.) The *blood-cell formula* may also alter.

The *humoral formula* changes during emotional phases, but there is no rigid relation to be assigned. Those given in the table are not absolute.

Analysis of a total emotional process.—Viewed as a complex process, the following components must be considered in regard to a total emotional process: (i.) A cognitive state associated with a nervous change in the cerebral centres (*a*), (ii.) a conscious appetency or impulse excited by (*a*) associated with a diffused outgoing process along motor nerves (*b*), (iii.) bodily commotion caused by ii. + *b*; this reaches consciousness through sensory nerves (*c*). Psychically, the emotion is made up of i + ii. + iii.; physically it comprises *a* + *b* + *c*. (After Maher,[50], p. 446).

§ 161.—DETAILS CONCERNING SOME OF THE FACULTIES AND PHENOMENA PERTAINING TO RATIONAL LIFE.

The term "*Mind*" is variously defined. It is taken as synonymous with (*a*) intellect; (*b*) intelligence; (*c*) consciousness, conscious intelligence; (*d*) the nervous system; (*e*) the brain (thus, behaviourists employ "mind" for "brain" from a dislike of the materialistic sound of that word[156]), (*f*) the entire psychical being. It is defined as (i) a sum-total of the mental processes (Howell's Physiology); (ii) that which thinks, feels and wills; (iii) "the terminus of an evolutionary progress from reflex and tropism by way of memory and imagination to intellect and reason"; (iv) "mind is to be interpreted in biological terms, as an organism, an organ of adjustment, a structural fabric" (Purposive school of psychology).[156] "Mind" is analogized with a room, in which the soul lives; with a mirror which reflects every thought coming into it. The purpose of this analogy is to illustrate differences between individuals just as there are different kinds of rooms, styles of decoration, coloured windows.

The *scholastic definition* of the mind is that it is the proximate principle of understanding, and designates rational life as opposed to sense-knowledge. Mind is not a special power over and above the memory, intelligence, and will, but is a potential whole comprising these three. It includes all those powers which in their operation are entirely removed from matter and from material conditions. (St. Thomas, Quaestiones Disputatae, De Veritate, x. l; and ad 12; Sum. Theol. 77, a. 5.)

Activity of mind.—This may be considered in three aspects: mobile, rhythmic, and chaotic. The former is shown in gentleness, generosity, gratitude, goodwill, easy-going disposition. Rhythmic activity is shown in reason and logic; in business-like character; moderation in love and hate, likes and dislikes. Chaotic activity is shown in intolerance, suspicion, imprudence.

A. The Intellect. (Plane III, IV).—The active intellect is defined as the power of abstracting, whereby the object obtained by the senses (the image stored in the imagination) is disengaged from its individual conditions and rendered intelligible. It "abstracts from the representations of concrete things or qualities, the typical ideal essential elements, leaving behind the material and particular"[17] (I. 74), "manipulating them like algebra without immediate reference to the concrete." It considers things apart from quantity, quality, place, and time.

Relation of intellect to corporeal organs.—Intellect is a function of the mind alone; it is not exerted by means of any organ (Maher[50], p. 239, 240). Intellectual activity depends *extrinsically*, or *per accidens*, on the organic faculties, as the schoolmen said (ib. p. 241). Intellect is a spiritual faculty.

Whereas sensations of touch, or phantasms of colour are possible only to a soul that informs a body, and can only be elicited by modification of an animated system of nerves, intellectual judgments are not the results of a stimulus of a sense-organ, but are products of purely spiritual action. "The inferior mode of mental life is awakened by the irritation of sentient nerves, the superior activity is due to a higher reaction from the unexhausted nature of the mind itself; and the ground for this reaction lies in the fact that the same indivisible soul is the root of both orders of faculties." (ib. p. 242).

B. Perception. Imagination.—These are shown on both the II and the III plane. (Cf. § 155).

C. Concepts v. Images.—The formation of concepts must be distinguished from that of phantasms, or images. The concept is a representation of objects of a class; the image pictures only one particular colour, shape, size, etc. The concept is fixed, immutable, and has no relation to time. The image is unstable, contingent, and fluctuates. The concept represents the nature or essence in an abstract condition, "ignoring or prescinding all accidental individualising conditions." "The image reproduces the object clothed with these concrete determinations." (Ib. p. 237).

D. Thought.—This cannot be called a "sensation," as shown by the question raised by Balmez (quoted in Maher, p. 243): "Is the perception of the difference of the smell of the rose and that of the pink a sensation? If we answer that it is not, we infer that the judgment is not the sensation transformed, for it is not even a sensation."

The mechanism of thought.—"The external objects stimulate the senses and effect a modification of the sensuous faculties." The result is a sensuous percipient act. "A sensuous phantasm arises in the imagination. The intellect now acts and abstracts the essence, thereby generating the concept which expresses the essence of the object. This abstract concept is then viewed by 'reflection' as capable of representing any member of the class. A formally universal idea is now constituted"[60] (p. 311). "By comparison, reflection and generalization, the idea is elaborated till we attain to the distinct and precise concepts or ideas which accurate science demands" (Maher[17]: vii. 633).

E. Reasoning.—This is defined as a process in which a succession of cognitive acts representing the various "notes" of a thing are unified, through relations being established between them. It is the opposite process to intuition. By intuition, one single act conveys all that can be known of a thing. The faculty of reason seeks new and differential characteristics. The most minute differences are essential. It includes: discerning power, sense of discrimination, classifying power, sense of proportion; observing power for (*a*) things, to see analogies and resemblances between them; (*b*) persons: e.g., character reading; (*c*) ideas, which link this faculty to that of the intellect. It also includes the attributes of orderliness, method, sense of absurdity, and therefore merriment, humour, wit, sarcasm, ridicule; curiosity, mimicry, character-interpretation as by actors; arguing, and reasoning power pure and simple.

F. Intuition, or intuitive knowledge.—This term is variously used. In the present volume it is intended to refer to a particular kind of knowledge obtained through the use of the intellect, as applied to many of the topics of medicine. That which is called esoteric knowledge, or "wisdom," may be included under this heading. Foresight, so-called mystical interpretation, insight are obtained by the use of the intellect influenced by mature experience. In medicine, as well as in daily life, we may

> "Look with spirit-eyes, and lo! shall see
> Glory in every leaf o'erwaves the head."
> (Night 94; Burton ii. 39).

"The spirit of faith is the habit of seeing everything in God, and God in everything."

Fr. Plus.

From the Scholastic point of view, the following are proper propositions:

(1) All knowledge begins in the data furnished by sense-experience.

(2) Primary principles are known by intuition.

(3) Abstraction and discursive reasoning are the instruments wherewith we discern the nature of the data of sense-experience, their laws and causes. Through these two *servants* of intuition the mind gains a scientific and philosophical knowledge of things (Sum. Theol. i. 58, a. 3; II-IIa. 49, a. 5, ad 2m.). Through the same two servants of intuition we arrive at the notion of immaterial beings and of God Himself[83] (i. 12)[84] (1, 84-88).

(4) "Concepts and reasoning, therefore, are in themselves inferior to intuition; but they are the normal" (i.e., usual, or most widespread) "processes of human knowledge."

"For the Schoolmen, the intuitive act of intellectual knowledge is by its nature the most perfect act of knowledge, since it is an immediate apprehension of and contact with reality in its concrete existence, and our supreme reward in the supernatural order will consist in the intuitive apprehension of God by our intelligence: the beatific vision. But in our present conditions of earthly life our knowledge must of necessity* make use of concepts and reasoning" (Sauvage[17] vii., p. 83).

§ 162. OCCULT PHENOMENA AND POWERS.—I. Common usage applies the term "occult" to such phenomena as psychic power, healing power, thought-reading, telepathy, clairvoyance, crystal-gazing, fortune-telling, discernment of the future, interpretation of dreams and visions, medium-ship, character-delineation (e.g. palmistry), divination, magic, sorcery, hypnotism, obsession, "willing" another who is at a distance to perform some desired personal service. Such phenomena are studied in theosophy, hermetic science, astrology (and medical astrology), spiritualism, Christian science, and also figure in new-thought movements and many other revivals and elaborations of ancient pagan pursuits.[17] (ii. 19; xi. 199.)

Whereas in all these cases there is the suspicion of trickery, deception, fraud, charlatanry, the term "occultism" is quite properly applied in an entirely different manner,—namely, to the investigation, by the use of reason and logic, of the occult (i.e., hidden, not self-evident) causes and effects operative in ordinary human affairs. The events of one's own daily life, and those of one's fellows, are all natural sequences of previous behaviour. This is not realized, and wrong conclusions are apt to be drawn—such as ascribing good or ill fortune to "fate," or an extramundane agency, or to the deliberate ill-will of others. Better knowledge of such a subject would enable one to avoid misjudging others, and to help them better, by realising that every soul has his own way to go and his own manner of proceeding on that way, toward the one final goal of all.

II. Occult phenomena in the common meaning of the term are (*a*) true, (*b*) false. The latter are achieved by deception, or illusion, charlatanry, or may be evidence of self-deception, or of disease (hysteria, neurasthenia, mental disorder, insanity). The former belong to two categories: (i) *Impersonal*; that is, explicable according to physical laws, though at present only imperfectly understood. Such phenomena manifest sometimes in inanimate objects, sometimes in organized beings—animal or human (in virtue of their possession of a receptive nervous system). (2) *Personal*. (i) *Natural*; that is, manifested in human "nature" (*a*) actively —in the case of phenomena of the kind referred to in § 163; (*b*) passively—in which case the phenomena manifested in one person originate in another or in numerous others (e.g. crowd-psychology), or in "supernatural" beings. (ii) *Supernatural agencies*: (*a*) so-called disembodied spirits; (*b*) angelic beings—good and beneficent, or bad and malevolent, evil, satanic; (*c*) the Supreme Being.

III. The word "supernatural" has another application which is properly and accurately explained only in Catholic philosophy (see Cuthbert,[117] p. 28, sqq.; Poulain,[154], chap vi; Vassall-Phillips[96]: etc.). Ordinarily, the human being lives a "natural" life, however cultured, unselfish, altruistic, pious, virtuous. He may live a "supernatural" life, by entering a "state of grace," so that the human nature is transcended (*super*), as indicated by Plane V in the

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* The lives of the saints, however, show that for them at any rate there was very often *not* such "necessity."

Chart. While living such a life, phenomena may become manifest (e.g. visions, revelations) which must not be confused with those called "occult."

IV. *Emotional states as a basis of occult phenomena.*—Strong emotional states may impress places and things sufficiently to affect other persons in the absence of the original impressor. Obsessions and haunted places are accounted for in this way. "A place or thing such as a weapon or article of furniture, almost anything in fact which has played a part in events that aroused very intense emotional activity on the part of those who enacted them becomes itself saturated as it were with the emotions involved. So much so that it can influence people of exceptional sympathetic powers and enable them to observe the original events more or less perfectly as if they were enacted before them. Thus in some cases the person will see the occurrence as if taking place before his eyes." (Pater,[146]; cf. Benson.[157])

V. *Occult powers natural to human beings.*—Some of the powers enumerated in the previous section are inherent in the human organization. They remain latent, or they develop more or less unwittingly as life advances, or they are developed by suitable training. In a few persons they are naturally so decided as to constitute a special talent, which may have been inherited.

The possession of psychic powers (clairvoyance, telepathy, thought-reading etc.) is sometimes looked on as evidence of special favour, or "spirituality," or of superiority (being a "very advanced soul") to be emulated. Such powers are taken as evidence of sainthood in Islam[62] and among Buddhists[32]. In the case of Christian saints, such phenomena are regarded as incidental, and not a criterion of sanctity. Not only is there no relation between the presence or absence of such powers and the virtue of the individual, they are attainable apart therefrom.

VI. The *basis* in the human constitution *upon which such powers depend* is fivefold :

(1) The vital faculty (**161** ; § 134) : vitality	Vegetative Life.
(2) Instinct (**180** ; § 153)	Sensitive Life.
(3) The emotional make-up (159, 164[11]) : (The scholastic concupiscible and irascible phenomena)	Sensitive Life.
(4) The imagination	Sensitive Life.
(5) The reasoning powers ; deductive logic	Rational Life.

§ 163. The following powers are specially pertinent to medicine:

(i) *Ability to read character.*—Fundamentally, this is the instinctive discernment of friend from foe. It exists from infancy, and is to be observed among domestic animals. With the development of reason, the consciousness becomes more and more aware of the attractions and repulsions produced by another individual, whether actually present or only thought of. As life proceeds, the contact with relations, friends, acquaintances, and strangers, leads to better knowledge of character, though perhaps nothing more than a form of "worldly wisdom." The reasoning power may be deliberately brought to bear, since delineation of character is amenable to rule, and can be studied, and taught to others.*

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* The Chinese sought to establish a relation between character and physique as long ago as 450 B.C. (Wieger, 144).

As in business, so in medicine, it is a subject worthy of attention. Indeed it is always imprudent to neglect it.

(ii) *Telepathy. Thought-reading.*—These depend on the first three of the above-named powers, and not on reason. They cannot be learned from books, and the experience cannot be taught to others. The most striking examples of genuine powers of this kind are furnished between (*a*) parent and offspring, when there is intense mother love; (*b*) persons between whom there is special friendship; (*c*) husband and wife, when there have been years of unbroken mutual understanding.

Since they are powers inherent in human nature, they may be developed gradually by concentration and will-power, exerted—not over others, but over oneself. (Cf. P'u Sung-Ling.[153])

(iii) *Healing power.*—(*a*) *Involuntary.* Success or failure in the handling of many cases in ordinary practice is usually ascribed to the concrete methods employed or the appliances used. Yet it is often thought that the personality of the doctor (whether he be specialist or not) has at any rate something to do with the efficacy of the treatment.

The following factors contribute: *inspiring confidence,* the bodily state being influenced through the emotions; *possession of great vitality,* which favourably influences a debilitated state through the vegetative powers, even apart from actual personal contact; *will-power* even if used unconsciously has a bracing effect on the patient; *psychic power,* even when the owner is unaware of it, may directly influence endocrine and hormonic (e.g.) activities beneficially, and the vegetative life in general. A disharmonious person will actually drain vitality from a weakly person.

The mother's touch takes away the bodily pain of her little boy.

(*b*) *Voluntary.*—Among the laity there is sometimes a deliberate attempt made to develop so-called specific psychic healing powers, through healing circles, and the like (theosophy, Christian science, etc.).

The fact that such practice is at the expense of exact anatomical and physiological knowledge and is exalted above medical training, cannot but arouse condemnation. Medicine herself is not a little responsible for the rising up of "healers," in her lack of appreciation of the insistent reality to many patients of the sufferings which she cannot explain or find a physical basis for. On the other hand, if the "psychics" possessed genuine powers, they would not lose them by going through the proper doors of the medical curriculum, and their patients would be the gainers.

(*c*) *Miraculous healing.*—By this term is meant supernatural intervention apart from human instrumentality.

Of this it might be said that Medicine would not suffer by candidly acknowledging its occurrence through her leading voices. Not to do so exposes her to disrepute in the minds of those who have experienced the cures, or have personally met with such cases. Though ignorance in various forms (prejudice, intolerance, party spirit) is inevitably in her ranks, it should not be chargeable to Medicine herself.

"The sectarian thinks that he has the sea ladled into his private pond." (Tagore, Fireflies, 209).

§ 164. LISTS OF TERMS APPLICABLE TO MENTAL FACULTIES AND AFFECTIONS

Individuals may be described in terms of a series of "notes"—the physique, the emotional make-up, the temperament, or disposition, the character, and the talents or intellectual capacities. These together make up the "individuality."

The following lists under each "note" do not attempt completeness, and some of the descriptive words might be placed equally under other headings than those given.

I. PHYSIQUE.—(i) *General.*—Robust, spare, wiry; strong or delicate ("constitution"); good or deficient.

(ii) *Special.*—Classified according to the nine systems of Dr. Abbott's[128] classification; or according to such types as these (Stanton*[105])—vegetative, thoracic, glandular, muscular, osseous, nervous, etc. *Basis:* features of the face; size and shape of head, hands, fingers,. feet, etc. Throughout, it is necessary also to specify the *qualities* of strength and weakness in their degrees (i., slight, or minimal; 2, moderate; 3, normal, average, mean, or "equable"; 4, well-marked; 5, very well-marked or excessive).

II. EMOTIONAL MAKE-UP.—Classification according to the five headings of the table in § 160. BASIS: the character and phase of the breath; the degree of vitality; the dominant imponderable element; the dominant humour. To draw up a formula to represent the emotional make-up conveniently for clinical work, the initial letters of the (Latin) names of the emotions may be used, the dominant emotion being expressed by a capital letter. Degrees of intensity are indicated by index figures drawn up as in the preceding paragraph. For example, a "Timor"-person might be represented by the formula $g^2\ l^2\ tr^1\ i^1\ T^5$; an "Ira"-person might be represented by $g^1\ l^3\ tr^1\ I^5\ t^1$.

LIST OF WORDS DESCRIPTIVE OF THE SEVERAL EMOTIONS.—These are arranged alphabetically, and not according to order of severity. In some cases the words apply also to mental states or attributes sometimes associated with the given emotional-type.

Joy: blissful, buoyant, ecstatic, enraptured, enthusiastic, entranced, exalted, excited, gleeful

Delight: affectionate, amorose, cheerful, contented, eager, excited, gay, inquisitive, lively, love of (*a*) objects (collecting spirit), (*b*) wealth in various forms; (*c*) opposite sex; pleasure; sentimentality; sympathetic. (Some of these convey ideas associated with this emotion).

Sorrow: aching heart, affliction, anguish, anxiety, bitterness, broken-hearted, chagrin, cheerless, dejected, depressed, despondent, discontented, displeased, disquieted, distressed, fretting, gloom, grief, infelicitous, inquietude, languishing, low-spirited, miserable, mournful, sense of (*a*) desolation, (*b*) disgust, (*c*) dryness, or aridity, (*d*) repugnance, (*e*) uselessness, solicitude, sorrow, stricken, tepidity, tribulation, troubled, unhappy, weak, wretched.

Anger: acrimonious, aggressive, ambitious, bellicose, bitter, boiling, bold, bristling, cantankerous, capricious, captious, caustic, choleric, churlish, contentious, contrary, cross, cynical, daring, desperate, displeased, easily offended, exasperated, exceptious, excitable, fierce, fiery, fractious, fuming, furious, hasty, having hatred, impetuous, indignant, infuriate, irate, irritable, irritated, jealous, passionate, peevish, petted, petulant, pugnacious, quarrelsome, querulous, rabid, raging, relentless, resentful, severe, shrewish, sore, storming, sulky, sullen, suspicious, tart, testy, vengeful, vexed, vindictive, violent, virulent, wrathful.

Fear: afraid, aghast, alarmed, anxious, apprehensive, astounded, browbeaten, cowardly, cowed, coy, craven, daunted, despairing, despondent, diffident, discouraged, dismayed, disquieted, dreading, envious, faint-hearted, faltering, fearful, fidgety, flinching, flurried, frightened, fussy, gentle, harassed, hesitating, horrified, horror-struck, irresolute, irritable, jealous, mistrusting, nervous, panic-stricken, penitent, perturbed, pious, pusillanimous, quailing, quaking, quavering, repentant, restless, scared, scrupulous, shrinking, shuddering, shy, skulking, sly, solicitous, startled, suspicious, temperate, terrified, terror-struck, timid, timorous, trembling, trepidation, unmannered, weak-hearted, whining, worrying.

Moods. Moodiness. Disposition. "Moods are the waves rising in your heart." They are due to the changes in the breath from hour to hour or day to day. The rate of change varies in different persons. When the change is comparatively frequent, the person may be described as "moody,"—changeable. This character may occur more at some periods of life than others, in the same person. Thus, it is more frequent at puberty and during youth. It is possible to rise above the cycle of moods, by the exercise of self-restraint. Moods change with surroundings (places and people)

III. Temperamental type, or disposition.—*Basis :* the humoral formula. This is expressed outwardly in differences of (*a*) texture—varying solidity of the tissues of the body ; (*b*) development of the various parts of the body ; (*c*) rate of activity of (i) vegetative processes—nutrition, waste, formation of germinal cells, etc., (ii) expenditure of nervous energy ; (*d*) tonicity of muscles and nerves. The words descriptive of temperament often apply also to II. Examples : aggressive, amiable, austere, buoyant, capricious, cheerful, chilling, churlish, complacent, conservative, courageous, depressed, despondent, discontented, energetic, enthusiastic, excitable, fastidious, forbearing, fretful, forward, gushing, harassed, impetuous, indolent, intolerant, irascible, irritable, jealous, malicious, moody, obstinate, petulant, querulous, rebellious, reckless, remorseful, ruffled, secretive, spiteful, stubborn, submissive, suspicious, taciturn, tranquil, tyrannical, uncompromising, unforgiving, verbose, vindictive, zealous.

Many of these terms also apply to the description of II and IV.

It is worth noting that among these types there are many which are supposed to be evidence of high human aspirations, and yet strictly belong to the "lower mind." Hence it has been very truly said : " Those sweet affections which incline the heart to God . . . come from the sensitive temperament, or bodily disposition, rather than from the solid piety of reason, and are carnal rather than spiritual " (Lasance[129]).—" Things that are apparently of the highest order in knowledge and art and sentiment are not things of the spirit, but things of the senses, alike in the philosophy of Thomas Aquinas and in the modern researches in the domain of the brain " (Vonier[97]).

IV. Character.—This is really a collective term, since all the other " notes " contribute to it. The terms which describe character may be grouped under sensuous, intellectual, moral, and æsthetic groups, or under the five sub-divisions of Mind in Sufi terminology (Ego, Memory, Mind, Heart, Conscience). Many terms have more than one component, and therefore do not belong strictly to one group alone.

Ego : Positive : acquisitive, amative, approbative, artful, artless, avaricious, arrogant, boastful, churlish, domineering, gluttonous, grasping, grouching, inquisitive, jealous, lewd, licentious, loud, obdurate, obstinate, pugnacious, quarrelsome, sociable, superstitious, vain, voluptuous, worldly. *Negative :* abstemious, apathetic, hasty, indolent, indulgent, miserly, shy, timid, unselfish, weak.

Heart : Positive : accessible, adaptable, affable, altruistic, ardent, benevolent, contemplative, emotional, charming, compassionate, facetious, fascinating, frivolous, gay, harmonious, hospitable, lively, peaceable, philanthropic, sincere, simple, tranquil.—*Negative :* tepid, meek, lenient.

Conscience : Positive : ascetic, austere, blameless, brave, conscientious, conservative, courageous, diligent, exacting, fastidious, humble, industrious, persevering, scrupulous, sensitive, strong-willed, thorough, truthful, well-balanced. *Negative :* deceitful, defiant, flippant, impetuous, impulsive, imprudent, malicious, pusillanimous, resentful, slow, treacherous, unforgiving, ungrateful, unsociable, untruthful, vindictive. (The moral sense may be absent).

Mind. Agnostic, ambitious, brusque, censorious, cunning, enterprising, foreseeing, intellectual, loquacious, methodical, opinionated, orderly, plausible, practical, prejudiced, refined, reticent, satirical, sceptic, serious, stilted, subtle, superstitious, uncompromising.

It should be noted that character is (*a*) native and unalterable (whatever some educationists say) ; (*b*) capable of being fashioned by the will of the person himself or by that of the persons amongst whom he lives. To have a " strong character " is considered the highest ideal by many ; (*b*) is therefore much advocated. But this idea is not necessarily true. Animals have character in that different kinds of ego are as it were personified in them. (cf. Paracelsus[29], p. 209).

Character is necessarily intimately related to physique, emotional type and temperamental type. Hence character delineation is possible from a close study of those aspects.

The skeletal system (bones, joints, ligaments, muscles, etc.) is the expression of the character of the cerebral nervous system. The viscera are the expression of the character of the vegetative system. Hence it happens that the usual autopsy discusses the least important part of the "case." (See §127.)

Interests. Ex.: personal interests: the preservation of one's life and health and general welfare; interests of the family; of the social circle, etc. Interests manifested in the use of the various talents.

V. TALENTS.—These are best classified according to the subject-matter to which the mind is directed; though they may be classified according to the faculty concerned.

Mechanical: constructiveness; architecture, etc.; technology.

Scientific: all branches of learning; mathematics, sciences, logic, analytical talents; calculating powers. Domestic science. Administration.

Intellectual: all branches of knowledge. Philosophy, history, sciences.

Æsthetic: arts and crafts, music, sculpture, designing, painting, poetry, literary art, dramatic art; wit; women's crafts of all kinds; poise.

Imaginative: originality; inventiveness.

Moral: perseverance, concentrating-power, law.

Other talents: language; intuitive perception; foresight; pedagogy; rhetoric; vocal.

Social: domestic interests; love of children, of home.

Political. Military. Sport (athletics, acrobatic art, adventuresomeness). *Commercial life.* Agriculture, Husbandry.

Much overlapping is necessarily present in preparing such a list. It might be extended to include all the subjects taught in universities, and schools of all kinds, for persons of all ages.

§ 165. INTERACTIONS BETWEEN THE VARIOUS ASPECTS OF THE SOUL.

I. INTELLECT.—Acts on vegetative life via emotions. (Effect of emotions on bodily functions: § § 139, 160)

Is acted on by—

(*a*) *Vegetative life:* physical desires, sense-impressions, especially in dream states and the like.

(*b*) *Sensitive life:* psychical desires, either in oneself or from others. The imagination influences it in hypnosis.

(*c*) *The will:* compelling attention or forcibly diverting attention.

(*d*) *Other wills:* ditto, includes angelic intelligences as well as human.

II. REASON.—Acts on vegetative life viâ the emotions, with their desires and fears.

Is acted on by sensitive life. Emotions strongly affect the reason in people of certain dispositions.

III. THE WILL.—Acts on *vegetative* life—effecting exterior actions.

Acts on *sensitive* life. Through sensuous cognition it acts on the emotions; feeds or starves or fails to starve the sensitive appetite, and so acts in the same three ways on the emotional states, aided by reason.

Acts on the *practical understanding:* with the aid of bodily mechanism it leads to the performance of useful or artistic work.

Acts on the *speculative understanding:* produces acts of judgment, or worship, or contemplation.

Acts on the *intellect:* "concentration."

Acts on the *memory:* "recollection," watchfulness.

Acts on *itself:* brings perseverance in the performance of a design conceived and elaborated by the intellect.

Actions upon the will:

Intellect: as when this propounds to the will what is the greatest good; conveys sense-impressions to the will.

Emotions: anger is very powerful in nullifying will to good, and increasing will to evil. So also, fear of another person, fear of an idea, fear of a thing. Passions hinder the judgment, and so affect the will. Emotions can be sublimated by interaction with Plane V.

Sensitive appetite: this acts directly on the will. If the objects of both appetite and will coincide, the will is strengthened; otherwise it is weakened. "The passions modify the organic conditions and this influences all cognitive faculties, and their intensity may prevent the mind from applying itself to the higher operations of the intellect and will" ([84] 9, 10, 77; [17] I., p.656).

Vegetative life: the corporeal state affects the will.

Environment: circumstances of life, personal atmosphere of neighbours, etc.; presence of persons of strong will, all interfere with or modify the actions of the (patient's) will.

Diseases of the Will.—Inconstancy, irresolution (lack of energy), impulsiveness (excess of energy; excitability), and "mortal sin" (domain of moral philosophy).

IV. Practical Application.—The fact that feelings, imaginations and thoughts influence the character is of the greatest practical importance, but by using the will-power to control them all, one becomes also master of one's life and "fate." Each emotional "note" has its own effect on body and mind, and can be over-ruled by the will. The influence of the imaginations is implied in the phrases "looking on the bright (or dark) side of things." Cheerful, gloomy, constructive, destructive, upright, deceitful thoughts all affect the sum-total of the conduct, the attitude of the mind towards others, and can all be over-ruled by the will.

"If the endowment is great in one direction, it is at the expense of some corresponding defect in another direction, as when tender-hearted men are lacking in judicial faculty, while men in whom the judicial faculty is prominent tend to be tyrannical" (Chu Hsi,[10] p. 59).

The study of all such interactions as are suggested by the lists of synonyms above given affords a better idea of what constitutes ideal "balance" in regard to the various components of the human being. A more graphic and tangible idea is at the same time obtainable in this way of much of the subject-matter of ethical and moral philosophy. To assign a distinct place for it in the domain of Medicine is not to disown the precedence of religion.

THESIS I. DISORDERS OF HEALTH

I. DEFINITION OF THE TERMS: CAUSE, DISEASE, SYMPTOM

Mesues
Auicenna
Aetius

191. Cause.—The word "Cause," in medical works, refers to that which initiates a given state of the human body, or maintains a fixity of such a state.

§ 166. It is to be noted, says Costæus, that the term cause does not refer to "efficient" cause, for disease, not being a definite entity, does not require an efficient cause. In other words, disease is not in-formed matter.—This applies equally in modern thought. If the changes of disease are modified biochemical reactions, they cannot be considered in terms of matter and form. But formal causes, and substantial causes, as well as the differences between qualities and dispositions, tendencies, passive and active states, and fixed morbid conditions, are all better understood under the precise thought of modern scholastic philosophy.—A cause may be understood as anything which effects, or assists, or maintains, or imparts a (morbid) function, whether actively or passively—morbid, because this part of the Canon is concerned with disease.

Human body. Not an animal body. The teaching to be presented does not necessarily apply to veterinary medicine.

Fixity of state.—Note that some states are labile, and others are stable or fixed. Labile states are more or less easily curable, but fixed states are very difficult to resolve or cure.

State.—We must distinguish carefully between cause, disposition, state, habit, symptoms.

192. Disease.—This is an abnormal unnatural state of the human body, in virtue of which injurious effects result. This injurious effect is the beginning of the disease. Such an abnormal state is either (*a*) an intemperament, or (*b*) an abnormal composition (see **205, 231.**).

§ 167. It may be noted that on this view the state is primary, and the disease secondary. To *the modern view*, the disease comes first, and the state is its result. The state is "the reaction to the causal noxious agent." Such a state is (i) detrimental to the body, (*a*) by an "aggressive" action upon the tissues by the agent, (*b*) as an unfortunate by-effect, producing degenerations of various kinds and degrees—sometimes mechanically (pressure on parts, interference with vascular supply)—sometimes incidentally, in the form of late toxic actions of the microbic poisons, (ii) beneficial to the body—though indirectly, since it is certainly damaged in the process—as tending to destroy the invading organisms or at least neutralizing the poisonous products.

In Avicenna's view, however, both agent and state are equally important. One cannot speak of a " reaction," any more than one would say (for instance) that sodium carbonate is a reaction to hydrochloric acid. Unless both substances are there, there is no reaction. So, without an abnormal state, there is no malady.

Note also that " poisoning " (" intoxication ") is not a disease.

§ 168. The following classification of words often used indifferently for " disease,' as if they were really synonymous, will help to a more precise usage.

A.—Terms bearing primarily a general sense.

Ill-health : not used specifically ; there may or may not be a diagnosable " disease."

Illness : the state of being ill ; sickness. Vaguely used for anything from slight disability to a fatal condition. More definite in meaning than " ill-health."

Malady : (lit. ill condition ; *male habitus*). A synonym for " an illness," appearing in polite literature for conditions not necessarily organic, or for conditions which have not been diagnosed, and yet may prove fatal.

Ailment. This may be some definite morbid condition, or simply imply discomfort (possibly short of actual pain). Literally, is synonymous with " a sickness," " an illness."

Disorders, in general. (cf. **198**.) This term is used still more specifically, as a rule. See under *B*.

Disease (Morbus. Maraḍ) in general. This word is technical, whereas the other words have a more popular application.

B.—Terms bearing a special sense, whether used in that manner or not.

(i.) Any condition in which an *organic lesion*—some macroscopic change in the body—is present, is - - - *" disease."*

This word implies a more or less serious disturbance, and even suggests the risk of death. The lesions present often determine the distinctive name of each separate disease. Where the etiology is still unknown, the disease may be provisionally named - - - *" sickness."*

(ii.) Conditions in which there is *not* necessarily any *organic* lesion, or where such a lesion has not been detected. These conditions do not receive distinctive names ; are not necessarily serious ; are probably not fatal. The name of each condition originally bore a distinct meaning :

(*a*) arising out of the temperament - - - - *" distemper."**

(*b*) arising out of the disposition or state. Now means simply " not fit " ; or, vaguely, " ill-health." - - - - - - - *" indisposition."*

(*c*) implies involvement of bodily functions. May be sub-classified according to the " system " involved. Or, vaguely, means simply " something is out of order." - - - - - *" disorder."*

(*d*) implies involvement of the nerves, or nervous system. (I.e., almost equivalent to " functional " as opposed to " organic " (Lat. passio). Implies a certain amount of pain - - - *" affection."*

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* Now only applied to a specific disease in veterinary surgery.

(*e*) A condition in which pain is the chief feature, whether general, or in some special region; but the pain is presumably not very severe. Sub-classification according to the region or organ - *"complaint."*

193. SYMPTOM. This is a phenomenon consequent upon this non-natural state of the body. Some symptoms are entirely abnormal phenomena, like the pain of colic. Others are (exaggerations) of a natural phenomenon, like the intense flush on the cheeks seen in peri-pneumonia.

§ 169. A lengthy discussion about what is to be regarded as a symptom is here given by Costæus. He shows that the word "symptom" is derived from the Greek to indicate something which occurs simultaneously with the disease producing it. He also discusses the exact meanings of the terms: weakness, impaired function, loss of function, abolition of function, "affections," preternatural excretions and retentions (cf. "retained" placenta). The question is also raised as to whether a given symptom is directly due to the disease, or is indirect, or is collateral, or is in no real relation to the disease.

Avicenna's brief statement really covers all these points. As regards our modern ways of thinking, one gathers together all the phenomena which are ever found to occur in a case of a given disease, and we simply arrange them as far as possible into the immediate effects, the remote effects, and those phenomena whose nature is not absolutely certain—they may be caused by the disease; they may be sequels; or they may be concurrent because some other morbid condition is, or happens to be, simultaneously present.

194. A short table of examples.

Example of a cause.	Example of its corresponding malady.	Example of the corresponding symptom
Decay; putrescence.	Fever.	Thirst, headache.
Fulness of lacrymal sacs from developmental error.	Obstruction of uvea.	Loss of vision.
Acrid "flux."	"Ulcer" in lung.	Flushed cheeks; curved nails.

195. (*a*) *The difference between "symptoms" and "signs."* We speak of a symptom in regard to its own intrinsic character, or in relation to that to which it belongs. A "sign" is that which guides the physician to a knowledge of the real essential nature of the disease.

It is asked: Are symptoms to disease as shadow is to object? The answer is, that the two are associated but are not inseparable. In other words, the symptom is *a* (scholastic symbolism, of §56, sqq.) and not *m.f.* The term " "symptom" refers to many phenomena, some of which are really the direct consequence of the disease, while others are only indirectly its result. This question would never arise were it not for the custom of supposing "diseases" are entities of some kind.

(*b*) *One disorder may originate a second.* Thus colic produces syncope, or paralysis, or spasms and convulsions.

Costæus says: To the patient, "colic" is "pain." The distension is the cause of the pain. The pain interferes with or even arrests the vitality of the part, and in that sense produces the syncope. Pain is: the contact of disordered disorganised function upon the consciousness. It is a form of "touch." The consciousness "touches" the impaired function. "Paralysis" is "loss of the faculties of movement and sensation." "Convulsions" = "depravity" of the faculties of movement and sensation.

There is, therefore, a certain literal truth in the general statement.

(*c*) *A symptom may be the cause of a disorder.* Thus, violent pain causes the suffering of colic, and syncope is the effect of the pain. The violent pain of an inflammatory mass is due to the descent of the matters to that spot.

Costæus adds: Pain interferes with the "breath," and may even arrest it. In consequence, a "refrigeration of the heart" takes place. That is, the temperament of the heart becomes below normal in regard to "cold." But this is a disease. This change of temperament accounts for the syncope.

Descent of matter (inflamm. exudate) as a cause of pain.—The acridity and similar qualities of the exudate do actually irritate the nerve-endings, and therefore produce pain in addition to that due to tension.

(*d*) *A symptom may be at the same time a malady.* Thus headache is an effect of fever, but may also last so long as to amount to a "disease."

§ 170. Costæus adds: Pain such as headache may simply be a symptom, that is, evidence of an "intemperamental state," or "solution of continuity." But, *to the patient*, it is *the* thing; it *is* the malady.—Little does it concern the patient that there is an underlying cause to be treated if the practitioner proves unable to relieve his pain.

Further, persistent pain impairs vitality; in this sense a pain is a disease.

§ 171. Symptoms are still confused with diseases in our text-books. Thus, "jaundice" appears amongst the diseases, instead of being placed separately along with a number of other characteristic symptoms, such as ascites, which is not taken as a specific disease even by the lay. Originally, symptoms were explained in terms of changes of quality and the like. This theoretical explanation was abandoned owing to a degradation of (metaphysical) knowledge. The symptoms then became "diseases." The diseases were then investigated, and found to be more numerous than the symptoms (which was already understood). Subdivisions were then made, and particular diseases specified and defined, and the multiplicity of causation emphasized. The exact succession of processes revealed by the microscope and biochemistry was elucidated. These successive procedures are the evidence of "advance" and "progress." All the while the fact is overlooked that the same processes occur in every "disease," and that when the whole subject, treated from pathology, is reduced to its least common multiple that range reveals itself as much the same as that of ancient lore. Cf. also § 173.

(*e*) *One and the same thing may be at once "disease," "symptom" and "cause."* Considered in relation to the present, it is "disease"; considered in relation to the past, it is "cause"; considered in relation to the future, it is 'symptom.'—Examples: the fever of consumption is the sign of ulceration of the lung. Considered in itself, it is the disease. Considered in its effect, it is the "cause" of gastric weakness. Again, the headache which fever gives rise to (in those cases where fever causes headache) (esp. meningeal disease) may remain behind (after the subsidence of the fever) and be itself the "disease." To particularize, the malady itself sets up inflammation of the meninges, and this sets up headache.

2. The States of the Human Body. The Types of Disease*

196. There are three states of the human body, according to Galen :—

(i) *Health*—a state in virtue of which the human body presents that particular temperament and configuration whereby all its functions shall proceed unembarrassed.

(ii) *Disease*—a state which is exactly contrary to (i).

(iii) *A third state* which is neither health nor disease. There are three variants of this :—(a) the health is not perfect and yet there is no actual illness. Ex. : the state in old persons, and in juveniles, and in those convalescent from illness. (b) Both states occur simultaneously in the same member : either in two quite different respects (as when the temperament of a person is normal, but there is compositional abnormality ; or in two respects which are related to one another (as when a person is healthy in form, but there is error in size or position of a member ; he may be healthy in regard to two passive qualities, but not in regard to two active ones). (c) Both states occur in one person, but at different times of the year (as when a person is well in winter but ill in spring).

197. Some disorders are simple, and others compound.

The simple disorders are where there is (1) one single kind of intemperament, (2) an isolated abnormality of configuration.

The compound (composite, compositional) disorders are where there are two or more kinds together, which together appear as one single malady.

198. The *simple disorders* comprise three groups :—

1. *Disorders of Temperament.*—In this case the members affected are formed of similar parts, but the temperament is

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* Costæus believes that Chapter I of the original should come in here, the present chapter being the real opening of this Thesis.

depraved. The term is not used unless the disorder is primarily in these essential parts, and then applies even if composite members are affected secondarily [*i.e.*, temperamental disorders are distinguished from compositional (**205**)].

Disorders of temperament may actually occur in any compound members one may think of, provided these are formed of homologous tissues.

There are sixteen kinds of disorders of temperament, as has been already stated. (**41**).

2. *Disorders of Configuration.* The members affected are the locomotive organs (the instruments whereby actions and functions are performed). These organs are formed of similar parts.

3. *Solution of Continuity and Dislocation.* The members affected have similar parts. It occurs in organs which are instruments. The disorder is one in which the function of being an instrument is interfered with. Such a solution of continuity occurs at a joint ; here we see that the separate members which go to make up the joints are not affected. The same thing applies in the case of nerves, bones, veins.

Any malady which depends on any of these three groups is named accordingly.

3. DISORDERS OF CONFIGURATION.

199. These are comprised in four main groups :—(i) Errors of development (malformations). (ii) Errors in bulk. (iii) Errors in number. (iv) Displacements.

(i) *Errors of Development.*

Group.	Subvarieties.	Examples.
1. Errors in form. Here the form is changed from its natural grace, to an extent which impairs its utility.	Deviation from a natural straightness.	Head broad and round, with ossified sutures to an extent hindering mental power.
	Straightness of a naturally curved line.	Curved shinbones ; genu valgum ; clubfoot.
	Squareness where there should be roundness.	Pupils congenitally elongate or slit-like or small.
	Rotundity where there should be squareness.	Great rotundity of abdomen.
2. Errors in passages.	Too wide.	Wide pupils ; varices ; aneurysms ; the dilated blood-vessels in pannus.
	Too narrow.	Small pupils ; narrowed eyes ; stricture of trachea or bronchi ; stricture of œsophagus.
	Occlusion.	Of venous orifices, e.g., in liver. Atresia (Tr.).

Group.	Subvarieties.	Examples.
3. Errors in cavities or sacs.	Too large (distended). Too small (contracted).	Scrotum. Contracted stomach; contracted cerebral ventricles in epilepsy.
	Obstructed and overfull.	Obstruction in cerebral ventricles in apoplexy.
	Emptied.	Cardiac cavities emptied of blood by reason of excessive joy or extreme pain.
4. Errors of surfaces.	The normal roughness replaced by smoothness.	At the orifice of the stomach; also in lienteric diarrhœa.
	The normal smoothness becomes rough.	Trachea; fauces (hoarseness).

(ii) *Errors in bulk.* (*a*) *Increase*: as in elephantiasis, unduly large penis (priapism); macroglossia. The disease which befel Nicomachus, whose body became so huge that he could not be moved. (*b*) *Decrease*: shortness of tongue so that it cannot reach the other parts of the mouth (tongue-tie). Atrophied and wasted members; general "decline."*

(iii) *Errors in number.* (*a*) *Increase*: (α) in normal organs—additional teeth; supernumerary fingers; (β) entirely abnormal—warts, calculus, enlarged glands. (*b*) *Decrease*: (α) in normal organs—congenital absence of a finger; (β) accidental—loss of a finger through amputation (accidental or surgical).

(iv) *Displacements.* (*a*) Displacement from the proper anatomical position. (α) Replaceable: *e.g.*, hernia of the intestine; tremor (which occurs through a quite unnatural to and fro involuntary movement). (β) Not replaceable: *e.g.*, fixation of a joint in a new position, as in gout where joints are hardened (ankylosed). (*b*) Displacement from the normal position in regard to neighbouring anatomical structures. This results in their being too near together or too far from one another. In such a case one part cannot move towards another as it should; for instance, adjoining fingers cannot touch one another. Or, one part cannot be moved away from another, either at all, or only with very great difficulty. For instance, in the case of joints flabby because of paralysis, or in the case of the eyelids. There may be a difficulty in opening the hands or in opening or raising the eyelids.

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* *Decline.*—Dhebul.—The term refers to a condition in which the body seems to wither or fade away without obvious reason, or in spite of taking food. The term refers primarily to the causeless losing of flesh by *horses*, whereby they come to be in an ill-conditioned state. The same word would apply to the wilting of cut flowers or the withering of plants from lack of water, or from reduction of their vitality to such a point that they will not imbibe water any more; that is, they cannot be "re-vived." Such a condition in man is noted by the laity, but is only referred to in medicine when its pathological basis is visualised; as, for instance, in wasting from tabes mesenterica, or tabes dorsalis.

§ 172. *Museum classification of errors of development.* (Abbott,[105] p. xv.)

1. Foetal structures normally not persistent.
2. Incomplete development.
3. Reduction in size (hypoplasia).
4. Reduction in number (subdactylism, etc.).
5. Persistent foetal structures.
6. Excess of size.
7. Excess in number.
8. Malposition; aberrant structures.
9. Anomalies due to foetal disease.

4. SOLUTION OF CONTINUITY.

200. The following members may undergo solution of continuity.

1. The *skin* (and the flesh beneath it): as excoriation, scarification, wounds. If pus is not formed or discharged, it is called a wound; if a discharge of pus is present, it is called an "ulcer." The presence of pus is due (*a*) to effete matters ("superfluities") being discharged at that spot; for the reason that it is weak. (*b*) The tissue is not able to digest all the nutriment which is brought to it, the excess being changed into pus.

The terms "wound," "ulcer" may also be applied to solution of continuity in places other than skin and flesh.

2. *Bone.* A fracture into two parts, large or small; or longitudinally in the form of a fissure.

3. *Cartilage.* The fracture may be in any of these three ways.

4. *Nerve.* Transverse section from incised wounds; longitudinal, and over a short distance, as "scission." Longitudinal and also extensive—in a contusion.

5. *Muscle.* If near the ends, or in the tendon: attrition. If transverse: severance, or incision. If longitudinal, but small in extent, with the formation of a deep hollow, it is called cavitation. If multiple, with the appearance of several swellings and hollowings, it is attrition with contusion. If the solution of continuity is in the belly of the muscles, it is called attrition or incision, or contusion, whatever be the direction of the injury.

6. *Arteries and Veins.* When these undergo solution ot continuity, they are "opened." If the injury is transverse, it is an incision; if longitudinal, it is called fission. They may be punctured (perforation). There may be a partial solution of continuity, whereby the blood escapes into the surrounding tissue-spaces, until their pressure arrests its further progress; this is called an aneurism.

7. *Membranes* (including the diaphragm): disruption.

Note that not every member can undergo solution of continuity with impunity. For instance, in the case of the heart, death ensues.

201. If one of two parts of a composite member be separated from the other, such that there is no actual injury to either, it is called a dislocation. A nerve may be twisted out of place, and this is also called a dislocation. It is also called a contorsion.

202. When a solution of continuity occurs where there are foramina, it may widen them. When it occurs in a place where there are no foramina, such may come into existence.

203. Any solution of continuity, whether it be in the form of an ulcer or the like, will heal quickly if the temperament of the member be good. But if the temperament be not good, healing may be delayed for a long time. Healing is specially delayed in persons with dropsy, or cachexia, or suffering from lepra.

204. If wounds are tightly bandaged, they may end in a very deep ulcer. Ulcers appearing in summer may last on into winter, and exhaust the strength.

Resolution of continuity is referred to in detail later.

5. COMPOSITE DISEASES.

205. *Definition.*—By the term "composite diseases" we mean—not that several diseases are conjoined—but that a number of morbid states concur, and out of them there emerges one single disease. This is exemplified by cutaneous swellings of inflammatory nature (including boils, pustules). Boils are small inflammatory masses, and ordinary inflammatory masses are large boils.

The following kinds of morbid state go together to make up an inflammatory mass*: (1) a disorder of temperament, this being associated with matter; (2) a perversion of form; (3) unhealthy configuration—one never meets with an inflammatory deposit without there being disfigurement, change of size, and there is often displacement as well ; (4) loss of continuity. This is the necessary accompaniment of the discharge of superfluities into the tissue-spaces, penetrating as they do into them all, and separating one from the other in order to make space for themselves.

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* Hence the popular name for a local inflammatory condition—"gathering."

206. *Site.*—Swellings occur in soft members, and sometimes also in bone, in which case the cavities in the bone widen and the exudate accumulates in them.

It is not surprising that a tissue which can accommodate nutrients should also accommodate waste materials if these should by chance penetrate into it, or should form in it.

207. *Causation.*—(*a*) The primary cause may not be evident, the corporeal change showing that material has been removed from one tissue to another (at a lower level). This is called a " catarrh." (*b*) The material cause from which boils and other inflammatory swellings arise may be immersed within other humours, without being deprived of its own harmful qualities.

Good humours may be discharged either by natural processes (as, for instance, in the case of women at the times of parturition and lactation), or by unnatural processes (as when good blood is lost through a wound). The bad humours, however, remain and continue to be harmful ; Nature then expels them. If the discharge is by the skin, pustules form.

208. *Classification of Swellings.*—Swellings may be classified according to the different kinds of matter of which they are made up ; namely according to the six kinds of material cause—the four humours, wateriness,gas.

There are both hot and cold inflammatory swellings. But the fact of their being hot does not say they are derived from bilious humour or blood. Any material intrinsically of hot nature, or any material which has become hot because of putrefaction, can give rise to a hot inflammatory mass.

Swelling = waram = apostema = tumour (used in a general sense) ; any " lump " or excrescence or protuberance. Intumescence, tumefaction, new-growth, nodosities —these are special kinds of swelling. In most passages an *inflammatory* swelling or mass is meant ; waram or apostema is translated accordingly. It may be noted that an apostema is more likely to be coloured, and to feel warm to the touch, whereas a swelling which can be called a tumefaction is colourless and does not fee warm ; that is, it is a " cold " swelling. (**211**).

209. While it is possible to subdivide these swellings according to the humours concerned, it is better to use special names in special cases. Thus, a mass derived purely from the blood is called " phlegmon " ; one derived solely from bilious humour is called "erysipelas." When the origin is compound, or dual, a double name is allotted. Thus, phlegmon erysipelatodes, if phlegmon is the chief feature; erysipelas phlegmonodes, if the erysipelas is the chief feature. When a collection of actual fluid has gathered, it is named an "abscess." This may occur in lymph-nodes (axilla; behind the ears; in the groins) which are then nothing but "corrupt" matter; and this is called a "bubo."

210. Hot Swellings.—The following are the phases of the hot swellings:

i. *The onset.* The humour makes its way to the surface, and increases in size, until the cavity is so distended as to be evident. ii. *The rise*: the size and tension increase. iii. *The acme*: the height of the malady, and stationary period. iv. *The decline*: (*a*) stage of softening from digestion of the contents and resolution or (*b*) maturation into pus*; or (*c*) a conversion into a hard or indurated mass.

211. Cold Swellings (lit. "swellings which are not hot"):

1. Composed of atrabilious humour:
   - i. induration (generally autumnal).
   - ii. cancer† (generally autumnal).
   - iii. glandular: scrofulous, other nodules and nodosities.
2. Composed of serous humour:
   - i. lax.
   - ii. soft glands; and winter swellings.
3. Composed of watery fluid: e.g., dropsy, hydrocephalus; hydrocele, and the like.
4. Composed of gases: tumefaction; puffiness; distension.

Puffiness. This stands for tahabbuj (Rome edition), or tahayyuj (Bulaq); cachexia (Venice edition) = tumefaction. The Latin glossary explains that it is meant specially as that which results from liver disorder; when it appears in the limbs it has a different origin. The puffiness of the eyes from lack of sleep or from too much sleep is also different.

212. *The difference between the glandular form and the other two kinds of atrabilious swellings.* The former is either quite loose within the tissues among which it lies, and is therefore easily moved to and fro by the finger; or there is adhesion, simply to the skin (as in strumous swellings). The other two kinds of swelling are intermingled with, and interfused with, the substance of the tissues among which they lie.

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* Note that pus is only *one* kind of "matter."

† Cancer appears in the Canon as a disease associated with change in the atrabilious humour. Therefore one condition for the production of this disease is the entry of S into the metabolic cycle in a pathological manner (cf. § 147).

213. *The difference between cancerous swelling and induration.* The latter is a slumbering silent mass which destroys the sensation (so that the part is numb), and is painless, and stationary. It may produce weakness of the part. A cancerous swelling progressively increases in size, is destructive, and spreads roots which insinuate themselves amongst the tissue-elements. It does not necessarily destroy sensation unless it has existed for a long time, and then it kills the tissues and destroys the sensation in the part. It would seem that indurations and cancerous swellings differ less as to substance than in the inseparable accidental qualities.*

214. The hard swellings arising from atrabilious humours are usually hard from the outset. They are often autumnal. They often become "indurations," especially if there be sanguineous humour present.—The same sort of change may take place in the swellings arising out of serous humour.

215. *Swellings arising out of serous humour.* These are of two varieties. They are either diffuse or circumscribed (nodular). The difference lies in the fact that the latter form is discrete among the surrounding tissues, whereas the other form is intermingled with them, and is therefore not discrete, but diffuse. Swellings formed of serous humour often arise in winter (the rainy season, or time of stormy weather). (Even) if they are "hot," they are white in colour.

216. *The difference between soft glands and "ganglia."* The latter are more adherent to the surrounding tissues; they feel nodular to the touch; they always slip back to the original position after manipulation; but they may be dispersed by certain strong medicaments, without compression, and then disappear permanently. They are often produced by toil. The application of a very heavy weight such as lead may disperse them.

217. Swellings arising out of serous humour vary in consistence according to the density of the contained fluid. They may be soft, thin, lax, or hard, or resemble the atrabilious type of swelling, or resemble the gaseous form. Tenuous serous humour flows down along the course of the nerve-fibres, and so reaches the muscles beneath the epiglottis and larynx.

218. *Watery swellings.* Examples: dropsy, hydrocele, hydrocephalus, and such-like. [Cysts.]

219. *Gaseous swellings.* These are of two different kinds: tumefaction; inflation. These differ both in essence and in mode of commixture. In tumefaction, the gas is intimately mixed with the substance of the tissue. In inflation it is aggregated, tense, tumescent, and discrete from the substance of the tissue. The former feels soft ; the latter feels more or less resistant.

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* Hence some cases of "Induration" may have been what is now called "scirrhus."

220. *Papular swellings.* These show the same subdivisions as inflammatory swellings in general. They are formed of (1) blood or sanguineous humour (true pustules) ; (2) purely of bilious humour : miliaria, sudamina, certain forms of eczema ; (3) both serous and atrabilious humour (morbilli, myrmecia, clavus, scabies, warts, and the like) ; (4) watery fluid (bullæ, vesicles) ; (5) gaseous material (emphysema).

The points of distinction which apply in regard to the kinds of pustules will be adequately dealt with in the fourth Book, should Allah be willing for its accomplishment.

6. DISFIGUREMENTS

221. There are some states which are not "disease," but are classed as such. These are conditions in which the beauty of the form of the body is impaired, either in respect of hairiness, colour, odour, or form.

1. *Affections of the hair.* Alopecia ; stumpiness ; scantiness ; shortness ; scission ; fineness ; coarseness ; curliness ; lightness ; colour-changes, such as greyness.

2. *Affections in which there is an abnormal colour of the body.*

i. Due to an intemperament :
  (*a*) material : jaundice.
  (*b*) non-material :
    (1) very cold intemperament : chalkiness ;
    (2) very hot intemperament : citron-yellowness.

ii. Due to extraneous agents : scorching sun, extreme cold ; much exposure to wind ;

iii. The presence of unnatural colours in the skin : (*a*) brought into the skin (vitiligo nigra), (*b*) arising in it (freckles, maculæ) ;

iv. Relics after the healing of scars : pock-marks ; old ulcers.

3. *Affections associated with bad odours ;* Ex. : fœtor of the mouth, or objectionable odour of the whole or of portions of the body.

4. *Disfigurements.* Ex. : Great emaciation ; excessive bulk ; undue thinness and fatness. (Malformations.)

"Excessive corpulence and excessive leanness are especially worthy of condemnation" (Charaka-Samhita[165] : i. 233).

7. The Stages of Disease

222. Many diseases show four stages—onset, increment, acme, and decline. These are distinct from the phases of health.

In speaking of "time of onset," and "increment," we do not wish to convey the idea that there are two extremes during which a state of disease is indiscernible. Each stage can be detected by the senses, and each has its own characteristic signs.

1. The "onset" is that period of time during which the disease is becoming manifested, and its characters are commencing to develop. There is no evident change in degree.

"Latent" disease belongs here; "occulta" as compared with the other three stages, which are "declared," "visibilia."

2. The "increment" is the period during which the *degree* of illness is hourly becoming more and more decided.

3. The "acme" is that period during which all the characters of the illness have become manifest, and remain so.

4. The "decline" (defervescence; terminal stage) shows abating of the signs of illness; and the further this period advances, the more nearly is there freedom from the symptoms of the diseases.

These stages may be applied both to the illness as a whole, and in regard to each of its component attacks or paroxysms. In regard to the whole course of the disease, they are called "general"; in regard to each of the attacks which occur in its course, they will be called "special" or "particular" or "individual" phases.

8. Concluding Remarks on Morbid States

223. Diseases are named: (1) according to the member affected (e.g. pleurisy, pneumonia, sciatica, podagra, nephritis, arthritis, ophthalmia, etc.); (2) according to the chief symptom (epilepsy, spasm, tremor, paralysis, palpitation, cephalalgia, otalgia, cardialgia, odontalgia, neuralgia, etc. (3) From the originating humour (e.g. atrabilious disorder); (4) from resemblances to animals which the disease produces (e.g. leontiasis, elephantiasis, satyrism); (5) from the first historical example of the disease; Telephic ulcer—Telephus, son of Hercules wounded by Achilles' spear, but healed by its rust; Chironia ulcer—Chiron, the first who successfully treated ulcers medically; (6) according to the substance and essential nature of the disease —fever, inflammatory swelling.

224. Galen classified diseases into: (*a*) manifest, or evident to the senses; (*b*) hidden, or internal: (i) easy to recognize (e.g. gastric pains, lung pains) ; (ii) difficult to recognize because not evident to any of the senses (e.g. diseases of the liver or of the air passages within the lung) ; (iii) only discernible by careful judgment (disorders of the urinary passages).

225. Diseases may occur in single members or in more than one. In the latter case there are the following possible relations : (i) association by natural connections ; ex.: stomach and brain, which are associated through nerves ; the uterus and breast which are connected by the veins.

(ii) One member is the channel for the other. Thus, the groin is the natural channel for inflammation to travel into the leg. The weaker of two of so related members will take up the excrementitious matters from the stronger ; for instance, the axillary region from the heart.

(iii) Simple contiguity ; e.g. the neck and the brain.

(iv) One member initiates the function of another. For instance, the diaphragm is concerned in the drawing of air into the lungs. (v) One member is the servant of another ; thus, the nerves serve the brain. (vi) Some third member is associated with two related organs. Thus, the brain is related to the kidney, and both these organs are related to the liver. (Disease in one is likely to have deleterious effects on the others.) (vii) *Vicious circles.* Disorder of the brain affects the activity of the stomach and impairs the digestion ; consequently the stomach supplies morbid vapours and imperfectly digested aliment to the brain, so increasing the disorder of the brain. Hence from the original illness, the malady spreads and continues, and runs in a circuit.

226. There are the following six degrees, ranging from health to disease :

1. Blameless health.
2. Not absolute health.
3. A state neither of health nor of disease, as people assert.
4. Potential illness ; where the body is on the verge of illness.
5. Slight ill-health.
6. Declared disease.

227. Diseases are curable or incurable. A curable disease is one which offers no resistance to treatment. An incurable disease is one in which there is some impediment to complete cure, so that whatever the doctor applies, the desired effect is not reached. For instance—headache which is due to "rheumatism." A disease is more likely to be curable when the temperament, the age, and the season are in proper relation.

If not, there must be a serious causal agent at work. One can only hope to cure or disperse the diseases of one season during the contrary season.

228. Some diseases turn into new ones, and so themselves disappear. This is very satisfactory. *One disease becomes the medicament for curing another.* Thus, quartan malaria often cures epilepsy [cf. G.P.I.] also podagra, varices, and arthralgias. A spasmodic disease may be cured by scabies, pruritus, and furunculosis. A certain type of diarrhœa is cured by inflammation of the eyes. Lienteria cures pleurisy. Bleeding piles removes atrabilious disorders, including sciatica, renal and uterine pain.

But the passage from one disease to another may be a serious matter. For instance, when an empyema spreads into the substance of the lung ; when meningitis becomes lethargia.

229. *Transmission of disease from person to person.*

A. *Transmission by infection.* (i) From one house to an adjoining one. Here belong, lepra, scabies, variola, pestilential fever, septic inflammatory swellings and ulcers ; (ii) from a house in the wind-track to another ; (iii) when one person gazes closely at another (e.g. ophthalmia) ; (iv) fancy : e.g. when a person's teeth chatter because he thinks of something sour ; (v) such diseases as phthisis, impetigo, leprosy.

B. *Hereditary transmissions.* Vitiligo alba ; premature baldness ; gout ; phthisis ; lepra.

Place in Family as a factor in the causation of disease (*Lancet*, 1928).

C. *Racial* transmission.

D. *Endemic* transmission. The sweating sickness of Anglia ; elephantiasis in Alexandria ; aurigo in Apulia ; endemic goitre, and many the like.

230. Do not forget that weakness of members, and a frail body may supervene upon intemperaments.

§ 173. This classification of the types of disease still holds good to-day. The nomenclature is rather different, because now made more definitely in accord with pathological findings.

Some confusion as to the scope of the various terms still exists even in the minds of those who are no longer students. Clinical and pathological conceptions do not agree in scope. On the one hand, there is an underlying endeavour to specify "diseases," and to separate out new entities in accordance with variations in the clinical manifestations. In pathology, the distinction between general and special is more clearly adhered to, and the latter is described as much as possible according to the former—which is proper.

In regard to an actual case before us, however, the pathology cannot be elucidated at once ; the clinical manifestations therefore receive the chief consideration. But such manifestations are limited in range, are of general character (universal, not particular), and should rank with genera in natural history ; the pathological character or process would furnish the specific name. Clinically, diseases naturally comprise swellings, deformities, discolorations, displacements, ulcerations, various solutions of continuity, aches and pains, and the like. Pathologically, there are only four main groups of lesions—inflammations, new-growths, nutritional changes (degenerations and hypertrophies), and errors of development. (The short list presented by Avicenna is not a real fault, when considered from such a point of view.) If such a system cannot be allowed either by academic medicine or the laity (who insist on a " name " for a " disease ") it has at least the advantage of enabling one to visualize from the first what is important to the patient and to concentrate on it.

The opposite procedure—that which rules the day—is that of describing diseases in all their forms and types, typhoid fever being awarded the crown. The literature is always receiving reports on new types of disease. This method has the advantage of being capable of unlimited extension, for the number of types is (as *should* be obvious) exactly the same as the number of individuals affected thereby. In other words, all these types are simply the expressions of the individual's make-up and have nothing whatever to do with the infective organism, except in so far as it varies in virulence (i.e., in the composition of its " excreta ").

The idea that treatment cannot be correct unless the " disease " is correctly named is also very widely spread, and has the same effect—that of blinding the mind to the real simplicity of truth. The unknowing abhors simplicity ; he ever seeks to " improve "—that is, to introduce more and more complexity.

THESIS II.—THE CAUSES OF DISEASE

ETIOLOGY

" Correlation, adverse or absent or excessive, between time, mental faculties, and objects of the senses, constitute in brief the threefold causes of disease affecting either the body or mind."—(Charaka-Samhita[155], i. 5.)

" If the activity of the life-principle takes place in a harmonious and regular manner, unimpeded by any obstacles, such a state is called ' health.' If its activity is impeded by some cause, and if it acts abnormally, or irregularly, such a state is called ' disease.' "—(Paracelsus[29], p. 181.)

1. Definition of Terms

231. There are three groups of causes of those states of the body which have been referred to as : health, disease, a state intermediate. These groups are : (1) *Primitive*, or extra-corporeal causes. These befall the body from without (trauma, heat, cold). (2) *Antecedent* causes. These befall the body from within (repletion, starvation). (3) *Conjoined* causes. Here disease is present only as long as two causes occur at the same time. When either is absent, the diseased state comes to an end (e.g. sepsis, in fevers).

The primitive causes are extra-corporeal ; namely : (*a*) from exterior agents, such as blows, exposure to very hot air, use of hot or cold viands ; (*b*) from the mind, which is here considered as distinct from the body. Here belong the causes of states of anger, fear, and the like.

Other examples : privation of food, shelter, covering ; environment (monotony, solitude, restraint, neglect, subjection, and their opposites). These are predisposing causes.

Resemblances.—The primitive causes resemble the antecedent in that there is a certain intermediate condition between each and the three states of the body named above. The primitive causes sometimes resemble the conjoined, in that there is no intermediate condition between them and the three states of the body. The antecedent and conjoined causes resemble one another in both being corporeal, or humoral ; that is, either temperamental or compositional.

Differences.—The antecedent differ from the primitive causes in being corporeal and in requiring an intermediary between them and the bodily state. Such an intermediary is not necessary in the case of the primitive causes.—The conjoined causes differ from the primitive in being corporeal, but without an intermediary between them and the bodily state. An intermediary may occur, but is not essential in the case of the primitive causes.—The antecedent differ from the conjoined causes in that with the former the state does not become immediately manifest, but only after a number of other intermediate causes have come into operation, these being nearer to the state than are the antecedent causes.

The above groupings of causes are the expression of a mode of thought now foreign to us. We seek more practical statements, and rightly. But when he thinks of causes, Avicenna goes back to fundamentals. This patient is before him, and the illness owes its origin to external factors which that patient cannot escape—the atmosphere, the weather, the climate, the drinking-water, the soil over which he lives and works; or to factors operating within the body, producing aberrations in the physiological processes.

The external factors naturally fall under the categories of the four elements (five, if we include " æther," represented by sunlight), and the memory is securely aided by thinking of each in turn.—The internal factors are classified according to the qualities—heat, cold, moisture, dryness. These also serve as aids to memory, since many aberrations in physiological processes amount to disturbances in these several qualities in the different parts of the body.

Changes of vitality as causes of disease are not here specified because they are secondary to the other causes. It is true that disease is evidence of loss of vitality, of loss of *radiance* of the " breath," but this is the effect of " antecedent " causes—repletion with humours; depletion of humours; and these again can be traced back to interactions of qualities and changes in the proportions of the " elements."

The following table is added for clearness:

Name of Cause.	Nature.	Relation to bodily state.	Examples.
1. Primitive.	Non-corporeal.	May be direct, or may only be through an intermediate state.	Solar heat. Violent exercise. Heating articles of food (e.g., garlic). Sadness. Wakefulness. Blows. Cataract. Fever.
2. Antecedent.	(1) Corporeal (i.e., a humour). (2) Temperamental. (3) Compositional.	Is indirect, via an intermediate state.	Suffusion of the orbits. Lachrymation. Repletion in fever.
3. Conjoined.	Corporeal.	Direct; immediate.	Blockage of an aperture by a humour. Blindness from obstruction of the optic nerve. Sepsis with fever.

232. Essential causes are such as pepper, which warms; opium, which cools. Accidental causes are such as cold water, which warms because it closes the pores of the skin, and hence the heat is retained; hot water, which cools because it opens the pores and liberates the heat; scammony which cools by expelling the calefacient humour.

An essential cause is one which alters the "nature"; that is, that on which the primary qualities of the body (heat, cold, moisture, dryness) depend.

233. It does not follow that a causal agent will alter the body even if it reaches it. Before the agent can act one of three conditions must be fulfilled. (1) The agent must be powerful enough; (2) the preparatory power of the body must be adequate; (3) there must be an appropriate time-factor. The agent must be exposed to the causative agent long enough for the latter to act. The states of the causes vary in their results. One single causal agent may give rise to quite different diseases in different persons, or at different times.

The Time-factor.—The time occupied before a given agent can produce its effect varies with different individuals, just as some persons have a long digestive time-factor and others a short one. This was spoken of very long ago (Charaka[155], ii. 793); the lesson being, in the case of digestion, that the number of meals per day should depend on the time-factor and not on popular custom.

A. *UNAVOIDABLE CAUSES OF DISEASE*

(i) Extracorporeal

2. The Atmospheric Air and its Influence within the Body

AIR (**234**) is an element which is in our body and in our breath (ruḥ). It is also continually being contributed to the breath. It is the agent which modifies the breath, not simply as element, but in virtue of its constructive and attempering nature.

235. We have made it clear already, and emphasize it again here, that *the term "breath" is not synonymous with what philosophers* (and theologians) *term "soul."*

236. There are two processes whereby the breath reaches its attempered state from the air—namely depuration and ventilation. Ventilation is the means whereby the temperament of the breath is modified in respect of the undue warmth which is usually the effect of condensation and imprisonment of the breath. (By temperament we mean that relative temperament which has been defined for you.) This attempering is attained by means of the air drawn in at the lungs and the pores of the skin, and by means of the distribution of that air through the arteries by means of their pulsation.

237. Compared with the temperament inherent in the breath, the air around us is very much cooler than it is compared with the temperament arising from the imprisonment or condensation of the breath. When the outer air enters the breath, it drives it on and mingles with it, and so prevents its transformation into the astringent fire-element ; for such a transformation would render the temperament of the breath faulty and unfitted for receiving the impressions of the sensitive soul (i.e. for maintaining life), and would interfere with the dispersal of the moist vapour of the substance of the breath.

238. Depuration is the process going on during expiration, and by it the separation of the fuliginous vapour in the breath is secured. The fuliginous vapour is to the breath what superfluous humour is to the body, and it is expelled (as bad air). During inspiration, the air enters into, pervades, and aerates the breath ; during expiration, the breath is purified into the air. (In this way the temperament of the breath is maintained.)

239. When the air is first drawn in, it necessarily cools the breath, but after the air attains the quality of the breath, through continued contact with its heat, it ceases to be an adjuvant, and is superfluous. Hence new air is needed, and when breathed in supplies the place of the other. The old air must be expired in order to give place for the new, and at the same time remove with it the superfluities of the substance of the breath.*

240. As long as the air is attempered and pure, and has no substances admixed which would be contrary to the temperament of the breath, health will come and remain. Otherwise the contrary occurs.

241. The air is liable to natural as well as non-natural changes, and may even undergo preternatural changes. The natural changes are those of the seasons. At every season the air changes to a new temperament.

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* It appears that the idea of gaseous interchange within the lung was not grasped. What we know as "residual air" comes to be what Avicenna speaks of as "breath" (ruḥ). Hence the description in the text is right in idea, but lacking in exactitude.

Antyllus remarks that the air is different in character (*a*) at the seasons of the year, (*b*) at the changes of the moon, (*b*[1]) at the rising and setting of the stars (Aegineta), (*c*) at the hours of the day and the night, (*d*) according to its thickness or tenuity, (*e*) during movement or repose (winds or calm), (*f*) if admixed with terrene exhalations, (*f*[1]) admixture with mists (Aegineta), (*g*) the kind of country, and its physical characteristics (Aegineta).

(*a*) NATURAL MUTATIONS

3. The Influence of the Seasons on the Atmosphere

242. The word "Season" has a different meaning for the physician than for the astronomer. According to the astronomer, there are four seasons, which are reckoned according to the position of the sun in the zodiac. According to the physician, spring-time, in temperate climates, is the time when warm clothes are less necessary, and yet no precautions are required against heat. The trees begin to leaf at this season. It is the time of flowers and leaves, and the beginning of the formation of fruits. To be more exact, it is the portion of the year between (or about, or slightly before, or slightly after) the vernal equinox and that at which the sun has reached the middle of Taurus.

Autumn is the opposite portion of the year in our latitude.§

§ This chapter is taken by Andreas de Alpago Bellunensis as the proof that Avicenna was a native of Persia. (cf. footnote to **369**).

It is the time of change of colour in the leaves, and the beginning of their fall from the trees.

In some countries spring may come sooner and autumn later.

The summer and winter, from the point of view of medicine, are the portions of the year remaining—and the interval between spring and autumn is much shorter than that between autumn and spring.

Summer is the whole of the hot season, and winter the whole of the cold season. It is the season opposite to summer, being less or greater in duration according to the latitude.*

Summer and winter are the "strong" seasons, spring and autumn are the "weak" seasons.

243. The temperament of spring is equable, and not hot and moist as some think. The proof of this rests with natural philosophy.

The temperament of summer is hot, because the sun is nearly vertical, over our heads, at this period. The power of the rays of the sun may be thought of as being concentrated in summer because instead of being refracted they form only a very acute angle, or are reflected back along the line of incidence itself. The effect is different according as the solar ray is axial, like the axis of a column or pyramid (in which case the ray is thought of as coming from the centre of the sun into an exactly opposite spot on the earth's surface), or is oblique. The axial ray is stronger because its impression is added to by the incoming rays from all other points. The oblique rays are the weakest (because in this case rays from other points do not join and add to them). In summer we are exposed to rays almost or quite axial. This is the longest season in our (southerly) climes. In winter the rays are nearly circumferential (tangential, oblique).

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* This passage is slightly rearranged.

244. In summer the light is very intense, and yet the sun is more distant from the earth, for the sun is on the increase. However, I discuss the subject of the distance or nearness of the sun in the astronomical section of my book on mathematical philosophy. The proof of the intensity of the heat and of the light of the sun is set forth in my book on natural philosophy.

245. *Influence of summer.* Summer makes the air hot and dry, because (1) its great heat disperses the water vapour; (2) it attenuates the "substance" of the air, and makes it more like "fire"; (3) there is little in the air at this season to separate out as rain or dew.

246. *Influence of winter.* Winter makes the air cold and moist, for contrary reasons.

247. *Influence of autumn.* In autumn, the heat subsides and the cold is not yet at its greatest because we live at a latitude where the rays are between the equatorial axis already referred to and the circumference. That is why the temperament of the air is between hot and cold, but not between moisture and dryness. When the sun has rendered the air dry, how could there remain behind in the air any humectants which would counteract the source of desiccation?

248. A state of the air tending towards coolness is not like one tending to moisture, because the change to cold is only slight, whereas the change to moisture is further. The change towards moisture which coolness induces is not as easily effected as one towards dryness, which heat induces. The latter is facilitated by heat because heat itself is a drying agent. Coldness is not a humectant. Humectation is facilitated by a certain degree of heat provided there is some substance present which possesses a certain degree of coldness. A certain amount of heat allows evaporation, but does not disperse (water vapour); and there is a certain amount of cold which is inadequate for bringing about inspissation, cohesion, or union.

249. Consequently, the state which enables the air of spring to remain at the same degree of moisture as in winter is not like the state which enables the air of autumn to remain at the same degree of dryness as in summer. The moisture of the air in spring is attempered by heat as much as the dryness of air in autumn is not modified by cold. Moisture and desiccation, therefore, are alike in regard to the action of "habit" and privation but not in regard to the action of their respective contraries. For, in this case, desiccation is simply "destruction of moist substance"; but humectation is not "destruction of dry substance," but "acquisition of moisture."

250. In speaking here of air as being "moist" or "dry" we do not, of course, refer to "form" or "natural quality." Such a question is remote from our present purpose. In calling air "moist" we mean that much aqueous vapour is admixed with it, or that its density has reached that of aqueous vapour. In calling air "dry," we imply (i) that the aqueous vapour formerly present has been dispersed, or (ii) that the air has become rarefied or attenuated until it comes to resemble the substance of Fire, or (iii) an air with which earthy vapours (which resemble Earth in being dry) are admixed.

251. Consequently, the moisture in the atmosphere which remains over from the winter is lessened in spring by a certain amount of heat accruing to it by the fact that the sun is approaching the middle of the heavens, and coming to be nearly overhead. But the dryness which remains over from the autumn does not encounter any moisture from the approaching coldness of the winter.

252. Further, would dry things become moist as quickly in cold air as moist ones would become dry in hot air, supposing the ratio between the cold and coldness to be about the same as that between heat and hotness? Obviously there would be a difference.

253. A third and better argument is that moisture cannot remain longer in hot air than in cold unless it were continually being reinforced by further additions of watery vapours. Dryness, however, needs not such continual emanation for its maintenance.

254. The reason why moisture disappears from bodies exposed to the air, or from the air itself, unless there is a continual reinforcement with further moisture, is that air is only cold in comparison with our body. It is not sufficiently cold in the places we inhabit to enable the moisture to be dispersed from the atmosphere. It is the power of the sun and the stars which disperses it. Consequently, though the supply of moisture ceases, the dispersal goes on until a state of dryness is rapidly reached.

255. *The atmosphere in spring.* In spring, there is more loss by dispersal than by evaporation. The reason is (1) there is little heat, and that is dispersed widely in the atmosphere ; (2) much heat is shut up in the bowels of the earth. Hence rarefied vapours are continually being *breathed out* towards the earth's surface.*

256. *The atmosphere in winter.* During winter the amount of heat concealed within the earth is very great—as is proved in treatises on natural science—whereas there is only a negligible amount of heat in the atmosphere. So there are two factors which together contribute to moisten the air—sublimation and condensation. This is the more so, because the substance of the air in winter is so cold that it becomes more dense, and adaptable for evaporation.

257. In spring, attenuation (dispersion) in the atmosphere exceeds evaporation. There is much less heat concealed in the earth. This is clear from the fact that something suddenly comes to the earth's surface at this time† which is more potent than the evaporating or the rarefying agent. This great access of material delays the evaporating process, and brings the (moisture) longer into contact with the abundant atmospheric heat ; and this completes the dispersion of the moisture.

This is the chief explanation of the fact that the vernal air fails to retain the bulk of the winter moisture, and that the autumnal air fails to retain the bulk of the summer dryness—apart from other reasons over and above what we have named.

Furthermore, there is not enough material to replace what has been sublimated and rarefied. The result is that the nature of spring necessarily tends to an equipoise between moisture and dryness, as much as it does to one between heat and cold. Still, one cannot deny that in spring there is at first a tendency to a certain degree of moisture. But in spring the moisture is *nearly* at equipoise, just as in autumn the dryness is nearly at equipoise. Even if there is in autumn not an exact equipoise between heat and cold, it will not be far from that, because in autumn the periods of the day just before and just after noon are like those in summer. The autumnal air, you see, is very dry, and can readily become warm and fire-like, summer having already disposed it to be so. But the nights and morning hours in autumn are frosty, owing to the obliquity of the sun's rays, and also because the tenuous matter in it is well disposed to undergo infrigidation.

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* Note the accuracy of this conception.

The fancy or jest that summer-heat and winter-cold are the result of "the greatness of the boiling of 'Hell' (i.e., the interior of the earth) makes a breathing twice a year, expiring in summer and inspiring in the winter" (Night, 487, Burton) may be here recalled.

† "The vapours of the sky descend, and vapours rise up out of the earth" (in spring). "The two co-operate in the work of renascence of vegetable life" (Li Ki, IV, i. 14).

Spring air has these two qualities in almost exact equipoise, because its air does not take up the heat and cold which the autumnal air so easily receives. That explains why the autumn night is not very different from the autumnal day. And if anyone should ask for why is an autumn night colder than a spring night, as one would expect the atmosphere to be then hotter, because it is so attenuated—he may have the reply that extremely attenuated air becomes hot or cold more quickly, exactly as does extremely rarefied water. For, if you heat water, and then wish to freeze it, it will do so more quickly than cold water would, because the cold penetrates more easily between the particles separated from one another by the preceding heat.

258. The human body is not as sensitive to the cold of spring as it is to that of autumn, because in spring the body passes from a coldness to which it is already acclimatised, to an increasing warmth. In autumn, the reverse is the case, for after being relaxed by the summer heat, the body is suddenly hit by cold ; this in spite of the fact that autumn approaches winter, whereas spring recedes from it.

259. Change of seasons has to do with the kind of diseases peculiar to each climate. Consequently the prudent physician will carefully study his own climate (atmospheric conditions day by day and month by month) and country in order the better to treat the diseases and maintain his patient's health by an appropriate mode of life, and (in order the better to choose) the reginimal measures appropriate to that climate and country.

260. Sometimes one day of a season is like some one day of another season ; and sometimes it is not. Some days in winter are spring-like; some spring days are summer-like; some days in autumn are hot and cold during the course of a single day.

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§ 174. The changes which the seasons produce on the human body are ascribed in this chapter at least in part to the changes which the seasons produce in the ground itself. We are introduced to the idea of "ground-air," "ground-water," "ground-fire" (mod. ground-temperature). That which the Canon here hints at is found to be entirely accurate in the light of modern investigations.

§ 175. *Movement of ground-air.* In the interstices of the soil there is an abundance of "vapour," which moves in and out of the earth into the atmosphere, as the ground-water moves up and down. We may rightly picture the earth as a huge lung. It exhales ground-air into the air we breathe, and if the former is humid, owing to a high ground-water level, the exhaled air will be "damp"; if the temperature of the earth be low, the exhaled air will be cold; if the ground-air be polluted the air we breathe will become fouled. The conception of the earth as a lung is given in almost those very words by Avicenna (**255**).

§ 176. *Movement of ground-water.* The ground-water may move merely up and down, or it may travel horizontally even to great distances. Its height varies with the rains, the season, the nature of the rock beneath, the character of the subsoil, and the presence of vegetation (crops, undergrowth, woodland, forestland). The movement up and down may be compared with tidal movements. The "waters under the earth" move, as do the seas. Clearly, then, floods and droughts, swampland and gravelly land, all have wide effects. The interference with vegetation also alters natural conditions, whether beneficially or detrimentally to human welfare. Lane-Notter (Enc. Brit. 25, p. 348), states that it has been estimated that an acre of cabbages will absorb from the land, and transpire from its leaves more than ten tons of water per day, when the weather is fine. The destruction of trees arrests the upward movement of ground-water, which previously was carried high up into the air as if by so many chimneys, and so affects other places at considerable distances.

§ 177. *Practical bearing of these facts.* Innumerable living things pass the whole, or part of their lives in the ground-water. They are carried along with it, both to the surface, and horizontally underground, possibly to great distances. The following groups may be specified: (1) Bacteria. These are derived from (*a*) the earth's surface from refuse in the neighbourhood of habitations, from excreta, trade-effluents, slaughter-houses, (*b*) deeper strata: cesspools, which do not necessarily filter off the organisms. (2) Protozoa. (3) Moulds and spore-bearing organisms generally. (4) Invertebrates of many orders.

These all flourish according to the presence of putrefactive matters in the soil (vegetable or animal), according to the ground-temperature, and according to degrees of anærobic state (which has to do with cycles of development).

> "The earth is a great stomach, in which everything is dissolved, digested and transformed, and each being draws its nutriment from the earth; and each living being is a stomach that serves as a tomb for other forms, and from which new forms spring into existence."—(Paracelsus, Paramirum[29], p. 205.)

Organisms gain access to the human body (*a*) directly from the surface soil, from the drinking water, from insufficiently cleansed vegetable foods, in partly decayed vegetables or vegetables which have become stale in the markets, from the inhalation of infected dust (especially the dust of earth pulverised by being parched in times of drought), (*b*) indirectly, by contamination of food by insects whose larvæ infest the soil to an extraordinary extent; by use of vegetables infected by invertebrates which themselves harbour pathogenic organisms.

§ 178. *Diseases associated with ground-water.* Damp soil favours putrefaction, with ultimate pollution of the air. Phthisis is favoured in such localities. When the soil is actually wet, from the rising of the ground-water, typhoid epidemics have been noted (Pettenkofer). Fleas on rats which burrow into soil polluted by plague-infected ground-water become infected themselves.

§ 179. *Diseases associated with variations of earth-temperature.* Cold soil favours bronchitis and other chest complaints. Warm soil favours the multiplication of certain organisms—those which flourish best at certain temperatures, and anærobically. (Favoured by admixture of the soil with manure.)

§ 180. The subject is therefore plainly of importance both in regard to the study of pandemics, epidemics and endemic diseases and in regard to the daily condition of the individual patient, the progress of his disease, and even the exact form which a disease takes in his case. As Avicenna says, the practitioner would benefit by noting the successions of weather-changes, the type of the season and the seasonal cycles, especially interpreted in terms of movements of the water, air, and "fire" in the earth.

4. THE INFLUENCE OF SEASONAL CHANGES ON THE BODY

261. When a season is harmonious* for a person of healthy temperament, it is appropriate for him, but not so if the person is of unhealthy temperament. But* if deviation from equipoise be marked, then the season will be harmonious or not correspondingly, but the person may become debilitated.† When a season is appropriate for a person of unhealthy temperament, the contrary holds.

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* "Harmonious."—Cf. "conformity with the laws of nature" (Li Ki,[47] VI, p. 535). In this case the season is considered as the variable, and the human temperament the constant. But it may be noted that the whole of our life is a matter of "conformity with the laws of nature," from highest to lowest. If the "Government" conforms in all respects, thus exhibiting the Great Conformity—requiring master minds and master wills—and if each individual in turn conforms, the society would become the ideal state. The application in regard to the incidence of disease in the individual being is very wide, and this section of the Canon becomes suggestive to a most interesting extent when the Classic just quoted is considered in association with it.

262. When the nature of two seasons at the commencement is opposite to that at their termination, and yet the alteration from the mean is not great (because not of long duration), as, for example, when a southerly winter is followed by a northerly spring, the second season will be more beneficial to the human body than the first, and will attemper the body. This is because the northerly spring is opposite in action to the southerly winter. If the winter be very dry and the spring very wet, the latter modifies the dryness of the former. But if the spring is not very humid and does not last long, then its modifying moistening influence will not be deleterious.

263. A single seasonal change is less injurious to life than are repeated changes—supposing the change in question is liable to prove mortal, and not one which reverses a previous change.

264. Among the temperaments of the atmosphere one that is hot and moist is more favourable to putrefactive processes.

265. Atmospheric changes are common in some regions, especially in the depths of the valleys ; they are only rare on hills and high mountains.

266. It is better when seasons are normal in character ; it is better that summer should be hot and the winter cold ; so with each season. If seasons are not normal in character, serious maladies will arise.

267. If all the seasons in one year are of uniform quality (for instance, wet, dry, hot, cold, all through the year) it is a bad year ; there will be many diseases in conformity with the quality of the year. The subsequent seasons will be fortunate. If a single season can arouse much illness of corresponding type, how much the more will not a whole year arouse ?

268. A person of phlegmatic temperament is liable to develop epilepsy, paralysis, apoplexy, trismus, convulsions and the like, *in a cold season.*

269. A person of choleric temperament may develop delirium, mania, acute fevers, acute inflammatory swellings *in a*

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* i.e., Taking the human nature as the variable, and the laws of nature as the constant.

† i.e., A non-proportional season would make a very non-equable person weak.

hot season. How much the worse would it not be if the character of that season persisted throughout a whole year?

270. With a premature winter, winterly diseases come on early. With a premature summer, summer diseases arise early. The diseases of the corresponding season will change accordingly.

271. An unduly prolonged season predisposes to many illnesses, especially in the case of summer and autumn.

272. Note that the effects of the changing seasons are not due to the season itself, but to the quality which is changed along with them, for this exerts a marked effect upon the states of the body. A change from heat to cold in the course of a single day, produces a change in the body accordingly.

273. A rainy autumn followed by a temperate winter (not without some cold, and yet not too cold, considering the geographical region) is more healthy. A rainy spring followed by a moderately rainy summer would be more likely to be healthy.

See also **581**, where the effect of the seasons on the pulse is discussed.

5. THE PROPERTIES OF HEALTHY AIR

274. The substance of the air is good when (1) it is not contaminated with extraneous matter, such as the vapours [from marshes or lakes, or from canals or open sewers: Aegineta; or the gaseous products from chemical works, etc.: modern], or smoke and soot.* (2) It is open to the sky [i.e. not shut in by high mountains: Aegineta; and, generally, is able to circulate freely round us: Nash]. (3) Is not confined in caves [cf. Grotto del Cane], or between high walls, or shut up in houses (or in underground cisterns).

275. Once a putrefactive process has begun in the air, it is more likely to continue if the air is free and exposed than when it is enclosed and concealed. Except for that, it is better that air should be free and exposed.

276. Healthy air remains clear unless there be admixed with it vapours from lakes or from stagnant and deep waters or marshy lands, or from places where potherbs are cultivated—especially cabbages and herb rocket; or where certain resinous trees or trees of bad temperament (box, yew) grow, or where nuts or figs grow, or where there are offensive odours and evil-smelling winds. In short, the air remains clear if healthy winds, coming from high or level ground, blow over the district.

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* One may also add: germ-laden dust, or particles of saliva and exhaled particles of moisture charged with possibly pathogenic microbes. Note that exhaled air contains 0.5 per cent. of organic impurities, which are much more a source of disease than the carbon dioxide gas produced by respiration.

Such air is not retained deep in the earth. It becomes warm quickly after sunrise, and becomes cold quickly after the sun has set. The air found confined within the walls of recently built houses, is not likely to be healthy, as the air is not quite dry owing to the lime in the walls.

Air is good when it does not interfere with one's breathing or cause the throat to contract.

277. You have already learnt that changes occur in the air which are (1) in accord with its nature, (2) contrary to its nature (preternatural), (3) neither the one nor the other.

Of the changes in the atmosphere which are not in accord with its nature, these are either contrary to or not contrary to it. Sometimes the changes run in cycles, sometimes not ; they may occur at certain seasons ; they may be periodic, and sometimes not.

It is more healthy if the seasons accord with the nature of the atmosphere, for otherwise illnesses come about.

§ 181. The effects of the different climates (hot, cold, damp, dry) on the body, and the diseases associated with each are given by various ancient writers, but the statements often are at variance with one another. It is sufficient to consider the possibility that, apart from infective agents, the temperature and humidity of a region affects the nutrition of the body, the vigour of the body, and is accompanied by liability of certain organs to disease (gastric, pulmonary, cerebral, cardiac).

The humidity of the air has been studied in modern times in its relation to liability to induce disease. The average normal relative humidity is 75 per cent. ; excess of moisture makes the air feel chilly. Mists are detrimental because they absorb the warming rays of the sun.

Stagnant air produces " stuffiness," for instance in rooms. This is due to the air heated by the skin remaining close to the skin, and preventing the latter from cooling. The surface circulation fails to receive its proper stimulus in consequence.[123] (p. 120.)

The following passage in the *Su-wên* is of interest : " *Huang Ti* asked in what manner cold and heat, dryness and moisture, wind and fire operated on man, and how they produced the transformation of all things." *Ch'i Po* replied : " . . . the Five Fluids come forward in turn, and each of them takes precedence once. When they do not keep in their proper spheres, there is disaster ; when they do, everything is well ordered," etc. (Forke,[23] p. 250-252.)

6. THE INFLUENCE OF THE CHANGES IN THE QUALITY OF THE ATMOSPHERE ; THE DISEASES INCIDENT TO THE SEVERAL SEASONS AND KINDS OF WEATHER

278. *Hot atmosphere.* A hot atmosphere disperses the breath and has a relaxing effect. A moderate degree of heat induces redness by drawing blood to the surface of the body. A great degree of heat results in a yellow colour because it breaks down (the components of) the blood which has been drawn to the cutaneous vessels. It also evokes sweating, diminishes the amount of urine, impairs the digestion and induces thirst.

Cold atmosphere. A cold atmosphere has a constricting effect. It strengthens the digestion, and increases the amount of urine. The reason for the latter is that it causes the humours to become imprisoned, so that only a small portion of them can become resolved into sweat. Another reason is given presently. Cold induces constipation because the anal muscles remain tightly contracted and the rectum does not respond to the call of the intestines ; hence the faeces linger long in the intestines instead of descending (out of the sigmoid), and their watery constituent is re-absorbed and passes into the urine.

Moist atmosphere. This has a softening effect on the skin, and renders the body moist as a whole.

Dry atmosphere. This has a drying effect on the skin, and renders it rough and dusky.

279. *Fogs.*—Foggy air has a depressing effect on the mind, and disturbs and confuses the humours. This kind of air is not the same as " dense " air, for the latter is dense in substance, whereas foggy air is so because the particles with which it is mingled are coarse (nearly or actually visible). The sign of such an air is that stars of small magnitude are scarcely seen through it, and even the brilliance of the planets is reduced to the luminosity of fixed stars. Murky air is produced (when it is very cold) by the presence of much fuliginous vapour, and of smoke, or by absence of good winds.

This will suffice about this subject for the present ; we shall return to it later in speaking of preternatural changes in the air.

280. THE SEASONS. Every season has its own proper characteristics. The characters occurring at the end of one season, and the diseases associated with this, agree with those occurring at the beginning of the next season.

CHANGES WHICH SPRING PRODUCES IN THE BODY.

281. When the temperament of the spring conforms to type, it is a very healthy season ; its temperament corresponds to that of the breath and of the blood, although the fact of its being in equipoise, as already explained, makes it tend towards the tenuity and enervating character of hot air, and also towards moisture. It renders the skin ruddy by drawing the blood to the surface to a moderate degree, and yet it does not effect that degree of dispersal of the breath which an overhot summer does.

At this season of the year, the humours of the body, hitherto stagnant, bestir themselves and circulate. Chronic disorders are therefore met with. In persons of atrabilious temperament the atrabilious humour comes into activity. Persons who have overfed during the winter without taking much exercise, so that the humours are redundant, are liable to spring-time diseases because these immature humours now become active and disseminated (through the tissues).

A spring which is prolonged without losing its attempered character will be followed by few diseases in summer.

282. *The diseases of spring.* Nosebleeding, effusion of blood, fermentation in the atrabilious humour or in the bilious humour. Inflammatory deposits ; carbuncles ; anginas (which may be of severe type); abscesses of various kinds. Varicose veins may " burst," there may be haemoptysis, and a cough becomes increasingly troublesome especially if the early part of spring be winterly. Those persons who have such disorders, and most of all, phthisis, will be in a worse state.

[Bronchitis, Bronchopneumonia, Influenza. In early spring : Measles.]

In persons of a phlegmatic constitution, the season of spring brings movement of the serous humour, and there is a tendency to apoplexy, paralysis, and joint trouble. Such disorders are more likely to arise if there be any vigorous corporeal or psychic movement (emotion), or if calefacient articles of food are included in the diet, for all these enhance the effect of the atmosphere at this season.

The most efficient *means of averting maladies incident to spring* : venesection ; purgation ; semi-starvation, or restriction of food, increasing the fluids (especially syrups), but reducing the intoxicating liquors, and even then taking them only diluted.

283. *Relation to periods of life.* Puberty and the time of life thereabout are benefited by spring-time.

CHANGES WHICH SUMMER PRODUCES IN THE BODY.

284. In summertime* the humours are dispersed; the faculties and natural functions are impaired owing to the excessive dispersion. The blood† and serous humour are diminished in amount; the bilious humour increases in amount; and, towards the end of the summer, the atrabilious humour increases in amount as a result of the dispersion of the attenuated matters, whereby the heavier particles stay behind in increasing amount. This is why old persons and those of similar nature feel stronger in summer.

The colour of the body becomes citron-yellow as a result of the dispersal of that which the summer heat draws out of the (surface) blood.

285. *Effect of Summer on the course of diseases.*—In summertime diseases show shorter stages. For, on the one hand, in robust persons, the warm air helps to disperse and mature the disease-matter, and also discharges it from the body. On the other hand, in weakly persons, the atmospheric heat only adds to their weakness by its relaxing influence. The sick person will therefore lose his strength and die. Furthermore, if the summer be hot and dry, illnesses are quickly broken up; whereas if it be wet, the humours becomes glutinous in character, the stages of the diseases are prolonged, and recovery is delayed. In that case the disease comes to be of long duration. For instance, a simple ulcer may become obstinate, may spread, and may deepen. Dropsy and lienteric diarrhoea, and looseness of the bowels are liable to occur. This is all because of the flow of redundant humours downwards from the upper parts to the lower.

286. *Diseases specially associated with the hot season.* If very hot: tertian, continued, and burning fevers; emaciation; pains in the ears; ophthalmia. If cupping be not done: erysipelas is common; also furunculosis. (These are of like nature to summer.) If spring-like: mild benign fevers, in which the tongue and fauces do not become rough and harsh, and there is no dryness of skin. This is because the sweating continues in plenty, especially at the crisis. For the heat and moisture co-operate with it—and the former resolves the humours, the latter softens the skin and opens the pores.

If southerly: deaths are frequent. Variola, morbilli, and similar serious diseases are common.

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* In summer the ground temperature is highest (up to 63 deg. F. at the end of August or in September).

† The blood is "thin" in summer; "thick" in autumn.

If northerly: this is favourable to health. If diseases arise, they are diseases of "expression"; that is, disease-matter is caused to circulate by the action of the innate heat as well as by the exterior heat; then, being exposed to the cold atmosphere, it is expressed from the body. This occurs in rheumatisms, catarrhs, and their sequelae.

If northerly and also dry: this is beneficial for persons of phlegmatic constitution, and also for women. Persons of bilious constitution are liable to develop eye-trouble, acute fevers of long duration, and diseases due to the oxidation of an excess of bilious humour (which has accumulated in such persons), and diseases arising from a redundance of the atrabilious humour.

[Summer diarrhœa, and bowel diseases, and enteric.]

§ 182. That the frequency of disease in hot weather is to be partly ascribed to the multiplication of flies under the favouring influence of the ground heat and warm air was of course not known in Avicenna's time. On the other hand, the cause of souring of milk in hot weather is still not understood, and the incidence of some febrile conditions is parallel.

Changes which Autumn produces in the Body.

287. The autumn season brings many diseases for these reasons: (1) there is exposure to a hot sun by day, and the nights are cold. (2) The humours are vitiated by the following: (i) abundance of fruits in the dietary. (ii) bad articles of diet. (iii) dispersion of attenuated matter, leaving dense particles behind and these then undergo oxidation. (iv) in summer the fermenting humours pass to the skin and the natural faculties can be brought to bear on them so as to disperse and expel them; but in autumn, the cold atmosphere causes the humours to be thrown back into the interior parts, where they accumulate and are (as it were) imprisoned. (3) The vigour of the body has been impaired by the preceding summer.

288. In autumn, the blood is much less in amount because this season is contrary in temperament to the blood. Consequently it cannot help blood to form, and that which the summer has already dispersed is not replaced. On the other hand, the bilious humour becomes relatively increased during the summer, and predominates during autumn. The atrabilious humour is more abundant at the end of summer because of the oxidation of the humours during summer, and this produces ash-like residues, which tend to sediment under the influence of the autumnal cold.

289. *List of autumnal diseases and disorders.* (i) Fevers: composite; quartan—due to abundance of atrabilious humour and the agent already described; associated effects—enlargement of the spleen, oliguria (the urine only passes drop by drop owing to the temperament of the blood being diverse—between heat and coldness), dysuria (partly because the urine only comes drop by drop), lienteria (because the cold drives the rarefied portions of the humours into the interior parts of the body) ; simple hectic fever ; this is more severe during this season because it is desiccant in character.

[Scarlet fever : diphtheria.]

(ii.) *Diseases of the individual organs.*—*Skin* : impetigo, excoriating scabies ; "canker"; pustules (especially if the autumn be dry and the preceding summer was hot).—*Throat* : acute "choleric" angina.

(Cf. the corresponding disease in spring, in this case due to serous humour the reason of the difference of humour in the two forms lies in the fact that the season preceding in each case favoured the prevalence of that humour, and it is this that constitutes the "soil" upon which the anginal infection thrives.)

Lung : Autumntide is harmful for persons suffering from phthisis and chronic pulmonary affections. If a person had such a disease latent in him at the onset of autumn, he would show the signs of it at the end of the season. *Brain* : apoplexy ; mental disease is common because the bilious humour is unhealthy and atrabilious humours are admixed with it.

[*Intestinal tract :* diarrhœa, etc.]

(iii.) *Pains* : in the joints ; sciatica ; pains in the back and hips (due to the stagnation and subsequent imprisonment of the insoluble parts of the humours which summer brought into circulation).

Worms.—These multiply because digestion is deficient, and there is lack of expulsive action.

290. Autumn is, so to speak, the foster-mother for the disorders left by the summer-time. Autumn is more healthy if the weather be very damp and rainy, and is more unhealthy if the weather be dry.

291. *Relation to Periods of life.*—The first part of autumn is to some extent beneficial for old people, but the last part is very injurious for them. (In the first place there is the cold, in the second place there is the residue of the oxidation of humours of summer-time).

CHANGES WHICH WINTER PRODUCES IN THE BODY.

292. Winter is a help for digestion, because the cold weather as it were embraces the innate heat and fosters it, and makes it more concentrated and less prone to dispersion.

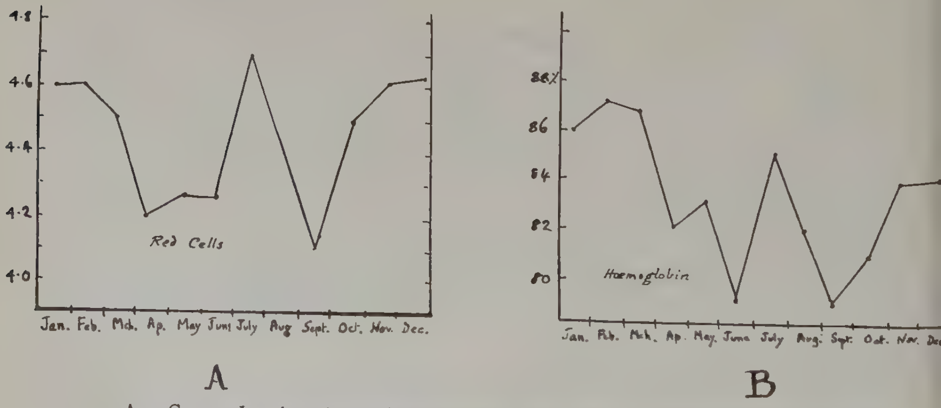
That is why fruits are scarce, and why people feel the need only of light aliments, and take little exercise after a good meal, and gather together in warm places.

293. In winter there is much sediment in the urine, as compared with the summer, and the amount passed is greater. The bilious humour is lessened in winter because it is cold, and the day is short and the nights long. The insoluble portions of the humours are more confined. During the winter, therefore, the diet should include more incisive and more attenuant aliments.

294. *The disorders of wintertime.* These are chiefly phlegmatic in character. The serous humour is plentiful at this period. Thus, it is very often present in vomited matter ; inflammatory foci are usually of a whitish colour in wintertime ; coryza is common, and begins when the autumnal air is changing. Less common are : pleurisy, pulmonary inflammations, hoarseness and sore throat. Less common still are : pains in the chest, side, back and loins ; nervous disorders (chronic headache) ; especially apoplexy ; epileptic seizures). In all these cases the serous humours are aggregated and confined, besides being increased in amount.

295. *Relation to Periods of Life.*—Winter is inimical to old persons and to those akin to them in nature.* Middle-aged persons are likely to be in health in this season.

§ 183.—The following curves showing the seasonal variations in the character of the blood (red cell content ; hæmoglobin) as made out by modern investigations, are of interest in connection with the above (**280-295**).



A. Curve showing the variations in red cell count in the same person throughout the year. 1-12, the successive months of the year ; 3.9–4.8, number of million red cells per c.mm.

B. Curve showing the variations in hæmoglobin content from month to month. 1—12, as in A : 78—88, percentage of hæmoglobin. (From Lippincott, *Journ. Lab. Clin. Med.*, 1927, 679.)

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* Note that in winter the ground temperature is lowest—41 deg. F. at end of February.

7. The Influences of Seasonal Sequences (Seasonal Cycles)

296. When a northerly spring follows a southerly winter, the summer will be very hot, and waters will accumulate, various matters being carried on from the spring into the summer. Hence in the following autumn, there will be an increased death-rate among adolescents ; and dysentery and intestinal ulcers and tertian fever will be frequent.

297. If the winter was extremely rainy, those due to give birth in the spring will be liable to abort, but if they carry to full time, the offspring will be weakly, or suffer from a fatal or dangerous illness. Men are liable to eye diseases and haemorrhages. Old persons are liable to catarrhs which pass down into the interior organs ; indeed they may meet with sudden death from a sudden obstruction to the flow of the breath through channels which have become overfull.

298. If the spring is rainy and southerly, following upon a northerly winter, there will be many cases of acute fever in the summer, and there will be eye affections, nose-bleeding, looseness of the bowels. Most of these depend on the flow of serous humour—imprisoned during the winter—passing down into the interior organs and then caused to move on by the heat. This is specially so in persons of moist temperament, like women. Sepsis and septic fevers are also common.

299. Should the summer become rainy at the time of the rising of the dogstar, followed by northerly wind, there is a prospect of good health and of the resolution of illnesses. Such a season is worse for women and for juveniles, for if they escape these illnesses, they run the risk of being afflicted with quartan, because the humours become oxidised, and a sediment or ash results, upon which dropsy, pains in the spleen, and weakness of the liver supervene. Such risk is only slight in old persons or in persons susceptible to cold.

300. If the autumn after a dry and northerly summer is rainy and southerly, it disposes people to suffer from headache, cough, sore throat, and coryza in the winter.

If the autumn after a dry and southerly summer be rainy and northerly, there will be many cases of headache, rheumatism, coughs, sore throat, in the winter.

If the autumn after a southerly summer be northerly, the prevailing diseases are those of "expression" (see **286**) and of congestion of humours, as already stated.

301. If both autumn and summer were southerly and wet, humours will multiply so that the diseases of expression will appear in winter which we have enumerated (**294**), and it will not be long before the disease-matter becomes coherent, aggregated, and imprisoned; for not only are the humours plentiful but there are no vapours to expedite them away from the body. This produces a risk of septic diseases. The winter will not fail to bring out many disorders because of this very cohesion of the undue amount of morbific matter.

If both autumn and summer are dry and northerly, the winter will be beneficial to a person for whom moisture is injurious, and also to women. Such persons will, however, be liable to dry eye-affections, prolonged catarrhs, acute fevers, and mental disorders with depression.

302. A cold and rainy winter produces burning of the urine.

303. A very hot and dry summer produces the following disorders in the following season: anginas (pernicious, and non-malignant); anginas which produce a discharge (these may burst externally or internally), anginas which do not produce a discharge; variola; morbilli (both these last two are favourable); eye-affections; mental depression; difficult micturition; retention of the menses; retention of the expectoration; hæmoptysis.

304. If a dry spring follows a dry winter, this is bad. The trees and herbage are liable to decay and they are injurious to the animals which feed on them; and, in turn, to the human beings which feed on them.

§ 184. *Abnormal quality of the seasons.* This idea is developed in an interesting manner in the Chinese Classic "Li Ki"[47] (VI) as showing the consequences in terms of weather (storms, floods, droughts, hurricanes, etc.), and in regard to the prospects in the crops (maturing too soon, maturing too late to yield any produce, diseases of crops, or infections by various larvæ, or insects), as well as the possibility of pestilential outbreaks, or the prevalence of such diseases as bronchitis, rheumatism, skin diseases, general ill-health (debility). Flourishing of certain objectionable weeds among the grain or cereals.

§ 185. Seasonal cycles have to do with the sequences of development noted among the very low forms of life in Nature, e.g., the growth of various orders of fungus (saprophytic, parasitic, non-pathogenic, sub-pathogenic, and pathogenic) in various types of soil, or landscape, depends on the existence of cold, cold and wet, warmth, warmth and wet, warmth and dryness, as they are traced through their various cycles (basidium, with basiodiospores, mycelium with gametes, and æcidiospores, uredospores and teleutospores). The cyclical changes which result in the apparent transformation of one "specific" micro-organism into another "specific" schizomycete require investigation in the open field of Nature. Bacteriology may be said to have been imprisoned in the doctrine of immutability of species, which is only upheld within the limitations of artificial culture-media and inoculation experiments in warm-blooded animals. Many of the types so familiar in human bacteriology may be looked on as terminal phases of cycles, capable of being maintained at the same rank for almost indefinite periods. The remaining nine-tenths of the cycle are unknown, from inability to cause the types to re-enter it artificially.

(*b*) INCIDENTAL MUTATIONS

8. CLIMATE

305. We now proceed to complete the discourse about the other changes in the quality of the atmosphere, not preternatural and yet not natural. That is, changes dependent on the celestial factors as well as on terrestrial ones.

306. *Celestial factors.*—The changes dependent on celestial bodies, such as the stars, are thus:—if many luminous stars rise in one region of the sky, and the sun approaches towards that region, the people living directly or nearly directly under the sun's rays are exposed to greater heat. But if the rays are oblique, the heating effect is lessened. The effect of a vertical position of the rays on the head is not nearly so great, unless they continue vertical for some time, and are direct. (Joannitius says: the rising and setting of the stars alters the nature of the atmosphere because when the sun approaches them or they it, the air becomes hotter. Under contrary conditions, the air becomes colder).

§ 186. *Solar, planetary and stellar influences on man, and their relation to disease.*—The subject may be summarized as follows. (*A*) *Genuine influences.*—(*a*) *Solar.* Modern observations (Abbé Moreux), voiced by H. W. Newton (Quart. Journ. Royal Meteorolog. Soc., 1928), show that the existence of planetary influences on this earth is only ridiculed by the ignorant. The observation of sun-spots shows that there is a relation to the character of the weather in certain regions, a relation to the development of earthquakes, and also a relation to mental states. This authority traces an eleven-year cycle of change both in the earth's magnetic changes and in the sun-spot cycle. The sun-spots are described as tornadoes of white hot gas, and affect both ultra-violet ray activity and electric radiations. He also suggests that there may be another cause concerned which controls both solar storms and terrestrial magnetic storms.

(The relation may be made more tangible by suggesting that after all there are actual flames of fire emerging from the sun and extending in a tenuous and yet real form right across space into our own atmosphere, with inevitable effects both in inorganic and organized worlds. Hence to suggest a relation between sickness, suicide, and crime and solar storms or even planetary disturbances is not new and cannot be lightly set aside).

(*b*) *Solar and lunar*. Everyday experience shows that the atmospheric conditions vary according to the time of day and night. The bearing of this on health has therefore been seen from the earliest times (Ayurveda, 1924, Aug.; p. 53). (*c*) *Planetary* rise and setting, *lunar* phases, positions of *stars and constellations* (Arcturus, Pleiades, etc.) are all data for the study of the progress of the seasons. Hence two kinds of cycles come to notice—the cycle of climatic changes, with an apparent relation to health and disease, both in cattle and in man; (ii) the cycle of extra-terrestrial changes. Naturally the observers of ancient times, who were so convinced of the unity of the visible universe, sought to reduce to rule certain coincidences in these cycles. Even if their association is irregular or only discernible from generation to generation the subject would invite study. Even nowadays it is unsafe to decide that there is nothing at all to study in it.

§ 187.—(*B*) *Fictitious relations*.—(*a*) *Symbolical*, permissible, but superfluous. (i) Stars may be spoken of as "healthy" or "unhealthy," "propitious" or "unpropitious" (Cantica, i. 104; Costaeus Annotations to Avicenna), as a convenient abbreviation for a more or less complex group of concomitant *climatic* conditions. (ii) The names of planets, or constellations may be used to represent certain types of mental constitution (Modern astrology). Thus, combativeness (fiery temper), ambition and pride, love and desire, melancholy, dreaminess, intelligence and wisdom. These are seven types assigned to as many planets. Again, the term "astral" may be claimed appropriate because common to the "stars" and the "astral form" of man. The same idea occurs in Paracelsus[72] (Hermetic writings, ii. 291), where he speaks of the senses and intelligence and wisdom of the offspring being its "sidereal body," and derived "from the stars." Such usage of names implies that there is some specially "deep" learning being propounded which is denied to the ordinary student, who has not been initiated into the inner circle of some cult—hermetic, rosicrucian, theosophical, and the like. The fact is, however, that the phenomena of the so-called "astral plane" are those of the "sensitive life" of scholastic psychology; careful and thorough study of this will show that the other obscurities are superfluous. (*b*) *Fallacious*.—Those who take the symbology of (ii) to be literally correct are "of the erring people" (Q. 6, 78). The poet voiced this error in his words: "A moon which blights you if you dare behold" (Night 34, annotated by Burton, in i. 315).

But in these days it is easier to fall into the error of supposing that there is *no* relation whatever between this world and sun, moon, and stars, than to mistake purely terrestrial relations for the transcendent.

307. *Terrestrial factors.* (*a*) Latitude ; (*b*) Altitude.—High or low ; (*c*) Mountainous regions ; (*d*) Maritime countries ; (*e*) Exposure to winds ; (*f*) Nature of soil.

(*a*) *Influence of latitude on Climate.*—If the country in question be between the Tropic of Cancer and that of Capricorn, the summer will be hotter than in a country further from the torrid zone. The countries within the equinoctial zone approach equipoise, for while the vertical incidence of the sun's rays does not make much impression, the fact of this position being maintained for several hours enhances their effect. The heat is greater at the middle of the eighth hour (the evening) than at noon. Consequently, when the sun is at the end of Cancer or in the beginning of Leo, it is hotter than it is at the end of its course. When the sun passes from the tropic of Cancer to a place of less declination, its heat is greater than when it has not yet reached the tropic of Cancer but is at the same declination. In the countries in the equinoctial zone, the sun is only vertical for a few days, and beyond that becomes rapidly oblique. For the declination increases much more rapidly towards the two poles than it does in the tropics. Yet, in the tropics, there is hardly any movement perceptible to the senses during any three or four days, so long does the sun linger ; and all that time the heat is continuous. Hence one may consider that countries whose latitude approaches complete declination are hotter than all others, and next to these countries lying within fifteen degrees on either side towards the two poles. In the equinoctial line the heat is not so very excessive as it is in those countries which are within the tropic of Cancer, and countries which are still further north are still colder.

This concludes what must be discussed in regard to the latitudes of countries, supposing them to be alike in all other respects.

(*b*) *Influence of the altitude of a country, whether high or low.*—Lowlands are hotter, highlands are colder. The strata of air nearer to the earth round here, where we live (Persia) are hotter because the sun's rays are more powerful ; the rays are more oblique on the highlands, which are therefore colder. This is explained in the work on natural philosophy. Low-lying places take up more heat, and are therefore hotter.

(*c*) *Influence of mountains on the climate of neighbouring* *country.*—The climate of mountainous countries from the point of view of residence, is discussed in **325.**

High mountains influence the climate in two ways : (i) they reduce the power of the solar rays on the country, and afford protection from them ; (ii) they serve as a wind-screen. The former holds good when the mountains are on the northerly aspect of those countries which are in the north. As the sun runs its course across such a northerly country its heat is reflected from the mountains, and so the country is warmed in spite of its being in the north. The same applies when the mountains are in the west, leaving the country exposed on the east. If the mountains are in the east, the heat which the country receives is less than when they are in the west, because as the sun rises, hour by hour passes before its direct rays reach the country, and by the time they fall vertically upon it, the sun is already about to wane, and the heating quality of its rays declines (*p*). When the mountains are on the west, however, the rays are more vertical with every hour.

(ii) Windscreens.—A northerly cooling wind may be screened from a country by a mountain-range, in which case a southerly warming wind gains the advantage. If a country lies between two mountain peaks the force of the winds across it will be much greater than if it were entirely flat. For when air enters a narrow channel it usually goes on blowing without ever stopping, just as water and the like would. Natural science furnishes the explanation of this.

Countries whose climate is rendered mild by mountains are exposed to some winds, and protected from others. If exposed on the east and north, they are protected on the west and south.

(*d*) *The influence of the sea on maritime countries.* The atmosphere in such countries is always more humid. If the sea is on the *north* side of the country, that will help to make the country cool, for the prevailing north wind is cold in character, having come over the face of the water. If the sea is on the *south* side of the country, a heavy southerly climate prevails, especially if a mountain range intervenes between the sea and the country.

If the sea is on the *east* side, the climate will be more humid than when it is on the *west* side, because the sun will not cease increasing the evaporation of water as it rises in the heavens, whereas this would not be the case if the sea were on the west.

To sum up, proximity of the sea makes the climate of a country damp, and if there are no mountains to prevent constant winds, the air is less liable to undergo putrefactive change. Were there no winds (because of an intervening mountain-range), the air would be liable to undergo putrescence (of the organic matters suspended in it), and the humours of the inhabitants would also tend to undergo putrescence.

Hence it is clear that it is better for the prevailing wind to be northerly ; it is next best if the wind is easterly ; then westerly, and it is worst if the prevailing wind is southerly.

(*e*) *The influence of winds.* (i) *On all countries in general.* In most countries a southerly wind is hot and moist. It is hot because of the sun's rays, and it is moist because usually the sea is to the south, and the strong heat of the sun on the equatorial seas disseminates water vapours which become carried on by the winds. This is why southerly winds are relaxing.

The northerly winds are usually cold because they have traversed mountains and snow-clad territories ; they are also dry because very little water-vapour is admixed. This is because there is very little evaporation of water on the north, and there are no seas intervening. On the contrary, they usually traverse frozen waters and desert places.

Easterly winds are between cold and hot in character ; they are drier than westerly winds, because there is less sea in the north-east than in the north-west, and we live in the north.

Westerly winds are moist in quality because they traverse seas and the sun, passing over the seas, warms them and evaporates the water ; but since the movements of the sun and the winds are in contrary directions, the evaporation is not as great as it is in the case of the easterly winds. Added to this is the fact that easterly winds are strongest at the beginning of the day, and the westerly winds blow strongest at the close of the day. That is why the westerly winds are not as hot as the easterly, and more inclined to be cold. The easterly winds are hotter, and yet, comparing both east and west with the south and north winds, they are temperate.

Sometimes the character of winds varies in a given territory as a result of other factors. It is sometimes an advantage, in some countries, for the south winds to be cooler, as happens when there is a snowclad mountain range on the south ; these winds are cooled in passing over the mountains. When a country is enclosed in burning deserts, the northerly winds are hotter than the south winds.

The simooms* are of two varieties: (i) those which have traversed very hot deserts ; (ii) winds like a sort of smoke, producing strange " terrifying " atmospheric effects simulating flames of fire. They are heavy and sultry. A sort of kindling and combustion occurs in them whereby the light part is separated and the heavy part (in which the burning fieriness remains) sinks down to the lower strata. All these are powerful winds. That is why wise philosophers believe them to arise in the upper parts of the atmosphere, although the material basis is from below.* But the movement, the blowing and whirling, begins in the upper regions of the atmosphere. This is the usual explanation, and its proof is to be found in my book on natural philosophy.

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* Simoom, " the poison wind," from Samm, poison, venom. (Burton, iv. 36.)

(*ii*) *The special climatic characters of the several countries.* This subject is deferred to a later chapter (**318**).

(*f*) *The soil.*† Countries present varied characters according to the dominant kind of soil. The following varieties of soil may be enumerated : clay, chalk, sandy (humus), rocky, or stony, miry or slimy, muddy, evil-smelling. The characters vary according to the mineral content.

Each kind of soil has its own effect both on the atmosphere and on the water.

This statement contains an important truth. Certain spas and health-resorts (Carlsbad, Bath, Droitwich, Baden, Bourbonne-les-Bains, Nancy, Wiesbaden) owe their virtue not merely to the chemical composition of the water which is taken by the patients, but also to the locality itself. The radiations which pass outwards at those parts of the earth produce a beneficent influence upon them as they walk over the ground.

§ 188. The soil may be described as the breakdown products of rocks or rock-formations of various kinds. Different kinds of soil differ in the size of their particles : coarse sands show particles from 0.1-0.2 mm. in diameter ; fine sands 0.5-0.05 mm. ; silts have particles varying from 0.04 to 0.004 mm. in diam. A soil composed of the four groups (sand, clay, chalk, humus) is called " loam " if good for crops, and is then specified as clay loam, or sand loam, according to the dominance of clay and sand respectively. It is the size of the particles which determines the movements or circulation of air and water through the soil. The amount of humus determines the fertility in regard to micro-organisms, whether beneficial to vegetation, or whether pathogenic to man. The presence of 4 per cent. of moisture in soil is the optimum for processes of decomposition in it. Cold wet soils favour diphtheritic infection (Lane-Notter).

Gravel soil is sought after as favourable for dwellings ; but if it be befouled by polluted waters, micro-organisms then flourish more easily than in other soils, and it becomes more inimical to health.

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* The lower strata are near " earth," and the highest strata of this world are " fire " (see § 54).

† The soil may be described as elementary substance with which are intermingled the decaying remains of animal and vegetable matter.

§ 189. The inorganic elements in plants are really *very finely powdered stones* (limestone, iron-stone, magnesium-stone, potash-stone, etc.), which have entered into a condition of food-substance under the influence of light and heat, and life.—(Gilbert.)

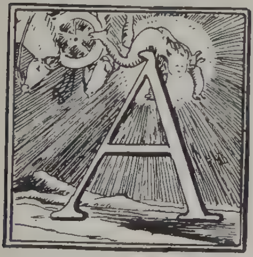
(*g*) *Misty districts and marshes.* Joannitius refers to these, saying that where there is decomposition in such regions, diseases and various plagues befall man.

§ 190. The factors on which the climate of a place depends, in modern thought, are as follows: (1) the earth heat: the range in this is 41-63 F. in England. When hot, the earth reflects ultra-violet rays (2) the radiant energy of the sun. "Sun-power," which is reflected from the sky and sea and earth. The rays are classified as visible, ultra-violet (actinic or chemical), and infra-red. The ultra-violet rays are arrested by smoke, mists, window-glass. (3) The cooling power of the air. This depends on the rate of movement of the air, as currents artificially induced, or wind; the amount of humidity; the actual temperature of the air. Cold air tries the heart and chest, more heat having to be produced; hot air tries the digestive organs and kidneys, because of the difficulty of getting rid of the superfluous heat. (4) Altitude. The air is thin or rare at high altitudes. (5) Ventilation of the dwelling-house.

To these must be added: prevalent winds; proximity to sea; scenery; nature of the ground—whether rocky (cold and dry), fertile (hot and moist), muddy (cold and moist); whether porous or impermeable; water-holding or not; actual chemical composition.

(*c*) IMPRESSIONS PRODUCED BY OTHER CHANGES IN THE ATMOSPHERE

9. The Effect of Unfavourable Changes in the Air which are Contrary to its Ordinary Nature



AIR **(308)** may be changed in (1) substance, (2) qualities.—The substance may become depraved apart from any increase or decrease in some of the intrinsic qualities. Such an air is named "pestilential."* One must remember that putrefactive processes can occur in the atmosphere just as they do in stagnant water.

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* Though we now know that "pestilential" air is so because it is germ-laden, that does not render this chapter "out of date." The general principles remain the same. At the present day it is assumed that the air is always contaminated from without—from the dust, e.g., on the ground that sunlight destroys germ-life. However, facts speak otherwise in open Nature.

309. *By the word " air " we do not mean the simple (imponderable) element*, but the atmosphere around us. Were the atmosphere absolutely pure, the word " air " might be used synonymously. But elemental substances cannot putresce; they can only change from one to another (as " water " which changes to " air," e.g.), and they do this by a change either in quality or in substance. *The word " air " in this chapter, therefore, as " atmosphere,"* is a composite substance, with spatial relations, composed of true (elemental) air, watery vapour, terrene particles (both of which form fogs and clouds, and smoke), and fiery particles—all together. *In the same way, when we speak of " sea " as " water,"* " lakes " as " water," and so on, *we do not mean elemental water*, but a composite substance, in which " water," though predominant, is mixed with air, earth, and fire.

This carries the reader back to **19–25**, and the comments thereon. The writings of the Chinese philosophers on the one hand, and of European alchemists on the other, may be interpreted accordingly, as Avicenna would have done. Examples of " earth ": soil, metals, naked creatures; " water ": spring water, rain water, ditch-water, lake water; the sea; millet; shellfish; " fire ": wood, oil, stones, lightning, the glow-worm, will-o'-the-wisp, trees, flowers, beans, feathered creatures. Seemingly there is very little in common; Forke[23] (p. 275, 276) discusses the subject, at the same time referring to writings by Agrippa von Nettesheim.

310. The air so present in water may undergo putrescence, with degradation of its substance, just as the stagnant water in pools decomposes, with degradation of its substance.

311. Air generally becomes pestilential from putrefactive changes towards the end of summer and during autumn. The symptoms which such air produces in the human body will be referred to later.

312. *Change in primary qualities.* Heat or cold may become insupportable by destroying the crops and the fecundity of nature. This change may be in the same direction as the quality of the season (for instance, the summer may become fiercely hot), or it may be in the contrary direction (for instance, a spell of very cold weather may arise during the summer season).

313. *Effect on the human body.* Changes in the character of the atmosphere produce changes in the human body. Putrescence of air induces septic changes in the body-fluids, beginning with the pericardial fluid, because this is exposed to it first.

Hot atmosphere. Great heat in the air renders the joints flaccid and causes the humours to disperse. There is increase of thirst, dispersion of the breath, failing vigour and digestion, all because the innate heat is the instrument used by the vegetative soul. A citron-yellow appears in the skin because the sanguineous humour becomes dissipated and loses its red colour, while at the same time the bilious humour increases in amount relatively to the other humours. The heart becomes warmer (over and above the innate heat), so that the humours flow and undergo decomposition, and in that state they enter the interspaces of the body and the weaker members. This is therefore not beneficial to persons in health. The following diseases are (however) benefited by this change: dropsy, palsy, cold catarrhs, tetanus, and certain (humid) spasmodic conditions.

Cold atmosphere. This drives the innate heat into the interior organs, unless the air has sufficient driving force itself to penetrate them. This would be morbific. Cold atmosphere does not interfere much with the circulation of the humours, or imprison them. But it favours catarrh, and is weakening to the nerves. It has a very injurious effect on the trachea. If the atmosphere is not so cold, it strengthens the digestion and all the interior functions, and improves the appetite. On the one hand it is more beneficial to a healthy person than a very hot atmosphere, and on the other hand it is detrimental to nerve-function. It closes the pores and causes matters within the bones to pass outwards to the surface.

Moist atmosphere. A moist atmosphere benefits many temperaments. It improves the colour and makes the skin clear and soft. The pores remain open. However, it favours septic processes.

Dry atmosphere. A dry atmosphere has contrary effects.

A dry climate, with warm soil, where the sun power is good and the cooling power is moderate (e.g. places with pine forests and sheltered valleys) is beneficial for chest cases.—Dry uplands in places where there are not periods of unsettled weather, and not near the sea, are beneficial for rheumatic cases.[123]

Choice of *food according to climate.*—For hot climates: no meat; use vegetable oils instead of animal fats. For cold climates: meat, animal fats. For dry climates: fruits are needed. For wet climates: sugar is needed.[123] (p. 1076).

Note that the *weather* affects *animals* as well as man. Cold, hot, damp, dry weather, thunderstorms, affect domestic animals.[48] (ii. 307.)

10. THE INFLUENCE OF THE WINDS ON THE BODY

In dealing with the changes in the atmosphere, we have discussed the characters of the various winds. We now proceed to deal with them from another point of view.

314. *The North Wind* braces and hardens the body ; it prevents the flow of visible excretions ; it closes the pores, strengthens the digestion, causes constipation, increases the urine, and makes septic pestilential atmosphere healthy. If the south wind precedes the north, the south wind excites mucous discharges, but the following north wind drives these fluids inwardly. A discharge may appear externally. Hence a catarrh [-al exudation] may become abundant, and chest troubles are common.

Diseases liable to occur when the north wind prevails : neuritic pains, pains in the side of the chest, in the joints, in the bladder and uterus ; difficult micturition ; racking cough ; shivering attacks.

315. *The South Wind* is relaxing for the strength ; it opens the pores ; makes the humours agitated and confused, so that they move from within outwards ; the senses become heavy ; it induces sleepiness. It is one of the causes of breaking down of ulcers, and makes them itch. It causes diseases to relapse, and debilitates. It produces itching in podagra. It excites migraine attacks. It causes fevers to become septic. It does not, however, induce sore throat.

316. *The East Wind.*—If east winds prevail towards the end of the night, and in the early part of the day, they will have already been modified by the sun, being made more rarefied and less humid. They are, therefore, drier and lighter in nature. But if they occur at the close of the day, and at the beginning of the night, the reverse is the case. On the whole, east winds are more beneficial to health than are westerly ones.

317. *The West Wind.*—If west winds prevail at the end of the night and in the early part of the day, the atmosphere will not have received the heat of the sun, and is therefore denser and more heavy. If they occur at the end of the day and at the beginning of the night, the reverse holds good.

11. THE INFLUENCE OF PLACES OF RESIDENCE ON THE HUMAN BODY

In a previous section we have considered the characters of certain inhabited regions. We now consider them from another point of view, in more detail, without troubling to avoid some repetitions.

318. *Characters upon which the effect of habitable regions on people depends.*

1. Whether high or low-lying.

2. Type of adjoining country (mountainous, maritime, open or sheltered).
3. State of soil (clayey, muddy, mineral, damp, marshy).
4. Whether the water is plentiful or scarce, stagnant or flowing.
5. Local factors (trees, mines, cemeteries, dead animals, putrescent pools).
6. Purity or impurity of the atmosphere.

As we have also learnt, the temperament of the air is revealed by the latitude of a territory, its elevation or lowness, proximity of mountains and seas, the prevailing winds, the kind of soil.

In short, whenever the air becomes quickly cold after sunset, and quickly warms after sunrise (we know it) is attenuated. If the opposite is the case, the nature of the atmosphere is the contrary.

The most harmful of all kinds of air is that which contracts the heart and hinders inspiration, and makes breathing difficult.

We now discuss each kind of locality in turn.

319. *Hot countries.* The hair becomes dark or black and frizzly, and becomes gathered into tight clumps like pepper-flowers ; the digestion is weakened. Old age comes on early, owing to the great dissipation of breath, and the draining away of the bodily moisture. This is seen in the land of the blacks (Ethiopia, Abyssinia). Persons who reside in such countries become aged at thirty, are timid (as the breath is so much dispersed), and the body becomes soft and dark.

320. *Cold countries.* Persons who go to live in cold countries become robust and stronger, and bolder and more courageous. The digestion improves. If the climate is also damp the people will become obese and fleshy and coarse. The veins will not show under the skin of the hands, and the joints are indistinct in outline. The body becomes pale and delicate.

321. *Damp wet countries.* Here the summer is not very warm, nor the winter very cold. People living in humid countries have beautiful faces with soft smooth complexions. They soon get tired with exercise. They are liable to develop protracted fevers, with looseness of the bowels and menorrhage. Piles, which are common, often bleed. Septic ulcers, fistulas, and aphthous and pustular stomatitis are common ; also epilepsy.

322. Here the summer is very hot and the winter very cold. People who live in dry climates develop a dry temperament. The skin becomes dry and dusky as a result of the great dryness and roughness of the atmosphere. The brain soon becomes dry in temperament.

323. *Residence in rocky and exposed places.* The climate in such places is very hot in summer, and very cold in winter. The body becomes hardened and sturdy, very hairy, strong, with large prominent joints. Dryness rules in such persons; they are very wide-awake, and resist bad habits, are pertinacious, warlike, skilful in the arts, and are energetic in character.

324. *Residence in high altitudes.* People residing in high altitudes are healthy, strong, and capable of much physical work; they are long-lived.

High altitudes are beneficial for nerve cases, but unfavourable for heart cases.

325. *Residence in mountains and snow-clad places.* People living in such places resemble those living in cold countries, being of great stature, strong, fierce, and given to toil, for the seasons vary much. These countries are windy, the winds being good as long as the snow lasts, but unhealthy when it melts, especially if there should be mountains to screen off the winds. In this case, the place becomes hot and damp.

326. *Residence in low-lying countries.* The air is very damp; and in summer is sultry, without modification by winds. The inhabitants are therefore unhealthy and debilitated, liable to be depressed and gloomy in disposition. The climate is unfavourable to the functions of the liver. Water is plentiful, and not cold, especially if it is stagnant, lagunal or marshy. The air is then unhealthy, as you already know.

327. *Residence in maritime regions.* The heat and cold of these regions is modified by their moisture; hence injury is resisted, and the body is inreceptive for whatever would otherwise invade it. As regards moisture and dryness, no doubt, such regions tend to be damp. If the country faces the north and has no protection against north winds (the sea being on that side, and the country being low), the climate will be more temperate. If it faces to the south, the climate will be hot and insalubrious (morbific).

Maritime places are beneficial for nerve cases.

328. *Residence in northerly countries.* Persons who live in the north resemble in character those who live in cold countries with cold seasons. Diseases of " expression " (**286**) and those due to confinement of the humours in the interior parts are liable to occur. Digestion is usually good. Such persons are long-lived.

The repletion with, and the lack of dispersion of, the humours predisposes to epistaxis and rupture of varicose veins. Ulcers readily heal owing to the vigour of the body and the purity of the blood ; the external conditions are also favourable to healing, because there is nothing to relax or moisten (the tissues). The fact that the innate heat is plentiful in such people prevents epilepsy from occurring, but if fits should occur they will be correspondingly severe, for it would have to be a very powerful agent to bring on such fits at all in these regions.

The great degree of heat in the heart makes such persons leonine (wolfish) in disposition.

Effect on the female sex. Menstruation is defective owing to constriction of the channels and the absence of the stimulus to menstrual flow and to relaxation of the channels. Some assert that this makes the women sterile; that their wombs do not open. But this is contrary to experience ; at any rate as regards the Germans [Turks, Parthians—in other readings]. My opinion is that the great amount of innate heat makes up for the absence of the stimulus to flow and to dilate the channels. Abortion, it is said, is rare amongst women in these climates, and this fact further supports the opinion that their vitality is great. However, parturition is not easy because the organs in question remain hard and will not open easily. If abortion should occur, it must be ascribed to the cold. The milk will be scanty and thick, because the cold prevents the blood from flowing easily enough to the breasts.

When the vitality is impaired, people in these regions (especially parient women) are liable to develop puerperal tetanus, and wasting diseases, because the difficult labour makes them strain so much, and consequently risk tearing the veins in the chest, and the nerve and muscle-fibres. The former leads to pulmonary ulcers; and the latter to spasmodic affections. Another effect of the excessive straining during parturition is ventral hernia.

As regards the age of puberty (in these countries) : hydrocele arises, but disappears as the persons grow older. Female slaves are liable to develop ascites and hydro-uterus ; but these also pass away as they grow old. Ophthalmia is rare, but is severe when it does occur.

329. *Residence in southerly countries.* The climatic features in these cases are those of hot countries and climates. The prevailing winds are not beneficial to health.

The waters are usually salty and sulphur-containing.

Moist humours accumulate in the head in people living in these regions, as that is an effect of the south ; they pass downwards and render the intestines loose. The limbs are weak and flabby ; the senses are dulled ; the appetite for food and drink is enfeebled ; and the lack of heat and weakness of the stomach accounts for the fact that wine is readily intoxicant. Ulcers heal and soften slowly.

Effect on the female sex : Menstruation is profuse and is arrested with difficulty. Pregnancy is rare. Abortion is frequent, simply because illness is so frequent.

Effect on the male sex : There is a liability to severe diarrhoea ; bleeding of piles ; humid ophthalmia. But these are quickly recovered from. Persons over fifty years of age are liable to paralysis, which follows on catarrhal conditions. At all ages there is a tendency to asthma, spasmodic diseases (tetanic spasm, epilepsy), because there is this tendency for serous humour to accumulate in the head.

Both sexes are liable to develop fever in which heat and cold occur simultaneously. Prolonged fevers come on in the winter, and are nocturnal. Acute fevers are rare because of the liability to diarrhoea, so that the more attenuated part of the humours is continuously dispersed.

330. *Residence in easterly countries.* When a district is exposed to the east, and is sheltered (by trees) on the west, it is healthy and the climate is good. This is because the sun is high over it in the early part of the day, thus rendering the atmosphere clear. The purified air passes on and gentle winds blow over it in advance of the rising sun, their direction being corresponding.

331. *Residence in westerly countries.* When a district is exposed on the west, and is sheltered (by trees) on the east, it does not receive the sun till late in the day, when the rays are already oblique. Hence the air never becomes rarefied or dry, but remains dense and humid. The prevailing winds are westerly and nocturnal. The climate of such places is therefore as of damp countries, and the residents have a moderately hot and heavy temperament. The climate is heavy because the air is heavy. Were it not for that, the climate would be spring-like in nature.

Such districts are not as healthy as easterly ones, and they tend to become more unhealthy. Some say that this kind of country is spring-like in its character, and very healthy compared with other kinds of country. But to my thinking the climate has very bad characters, and this is because the sun's rays do not reach them until they are no longer strong enough to warm the atmosphere ; and then the sun sets at once, and a cold night then suddenly sets in. As the air is of humid temperament in such countries, the inhabitants are liable to have husky voices, especially in autumn ; for they are prone to catarrhs from stagnation of the serous humour.

332. *How to choose a place of residence, and what type of house should be selected.* The choice of a place of residence depends on : (1) the soil (see **307**f) ; (2) position—whether high or low-lying (atmospheric pressure, see **307**b) ; (3) whether exposed or sheltered, bare or covered with trees or woodlands or forests (forests harbour moisture and foster the decay of vegetation) ; (4) the water-supply—its quality, whether the water is covered in (artificially) or exposed to the air, whether concealed or deep, marshy, whether thick or limpid, whether flowing from a height or running over stones ; whether salty or "crude" ; (5) the prevailing winds—whether exposed to or sheltered from the sun ; whether salubrious or not ; fresh (cold) and bracing or dry and sultry (having blown over wide tracts of land), or moist ; whether cold and healthy ; (6) the neighbouring country (maritime, marshy, presence of lakes ; mountainous, or flat ; rich in minerals or not ; forests, jungles, etc.) ; (7) whether the ground air is pure and healthy, impure and unhealthy, making the natives prone to illness ; what sort of illnesses prevail ; (8) whether the natives are robust, have a good appetite and digestion, and are accustomed to food of good quality ; (9) the construction of house : whether with large, roomy or with narrow entrances ; good ventilation, wide chimneys. Do the doors and windows face east and north ? One must be specially careful to arrange to have the easterly winds able to enter the house and see that the rays of the sun can enter all day, because the sun's rays render the air pure.

One should be close to plenty of sweet running water, open to the sky, frozen in winter, and warm in summer, as all this is favourable to health. Nearness to stagnant water and that to which light has no access is unfavourable.

(10) Amount of light ; temperature (hot, warm, cold) ; rainfall—average humidity of the atmosphere (see **249**).

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§ 191. *Type of house.* The importance of this is well-known, but not as often practically attended to. Overcrowding of houses is well-known to be a source of continual illness and loss of working capacity, yet only very slowly remedied. It is not sufficiently realized that the befouling of the air through lack of air-space between the houses is as dangerous as close contact with the organic emanations from the human body. Such emanations cling to walls, floors, furniture, fomites, and foster the multiplication of infective organisms. The relation between mouldy walls and phthisis was insisted by Nash[136] (p. 52).

We have now discussed the atmosphere and the geographical influences sufficiently. We now proceed with the corporeal factors.

(ii). CORPOREAL CAUSES UNAVOIDABLE BECAUSE PHYSIOLOGICAL.

12. THE INFLUENCE OF EXERCISE AND REPOSE.

§ 192. There are three kinds of Movement :—(1) Local ; successive and continuous reception of new positions in space ; here belong exercise, gymnastics, bathing ; (2) In quality : alteration ; this consists in the reception of new qualities ; (3) In quantity (increase or diminution). A certain amount of matter is acquired or lost. (Mercier[58] 2, 517).

333. The effect of exercise on the human body varies according to (i) its degree (strong, weak) , amount (little, much), and according to (ii) the amount of rest taken, (iii) the movement of the humours associated.

334. All degrees of exercise (strong, weak, little, or alternating with rest) agree in increasing the innate heat. It makes little difference whether the exercise be vigorous or weak and associated with much rest or not, for it makes the body very hot, and even if exercise should entail a loss of the innate heat, it does so only to a small amount. The dissipation of heat is only gradual, whereas the amount of heat produced is greater than the loss. If there be much of both exercise and repose, the effect is to cool the body, because the natural heat is now greatly dispersed, and consequently the body becomes dry. If the exercise entail the handling of certain material, that material usually adds to the effect of the exercise, though often there is a lessened effect. For instance, if the exercise be in the course of performing the fuller's art, there would result an increase of coldness and moisture. If the exercise be in the course of the performance of the spelter's art, there would be more heat and dryness.

335. Repose always has (a) a cooling effect, because (i) the envigorating life-giving heat passes away, and (ii) the innate heat is confined. It has (b) a choking and moistening effect, because of the lack of dispersal of waste matters.

13. CONDITIONS ASSOCIATED WITH SLEEP AND VIGILANCE.

336. The effect of sleep is very similar to that produced by repose ; that of vigilance is very similar to that produced by exercise. In each case we must consider certain properties.

337. Sleep (1) *strengthens all natural functions* (digestion of the food and the elaboration of the digestive products into good blood), by aggregating the interior heat and by relaxing the sensitive faculties. (These are in abeyance, in sleep). It does so because it renders the channels of the (mind-) breath moist and relaxed. (2) It *makes the substance of the breath turbid*, and prevents the exit of the vital breath (so that the vital heat accumulates in the interior parts). (3) Sleep removes all types of lassitude (**821**) and it *restrains strong evacuations*. If then followed by appropriate exercise (gymnastics), the power of running is increased unless (effete) matters accumulate which only the skin can remove. (4) Sleep sometimes *helps to expel these effete matters*, in that it imprisons the interior heat and procures the dissemination of the nutrients throughout the body, and the expulsion of the effete matters which are under the skin, as well as of those which are deep in the interior parts of the body. These innermost matters push on those which are in front of them in successive waves, until they finally reach the subcutaneous tissues and are thence discharged from the skin. The same action is achieved by wakefulness to a still greater degree, but in this case the effete matter is removed by dissipation, whereas sleep removes it by inducing sweating. (5) Sleep induces *sweating*. It does this by a process of overcoming the effete matter, and not by a process of continuous dispersal of attenuated matter. When a person sweats heavily during sleep, without obvious cause, nutrients accumulate in excess of the bodily requirements; when sleep encounters matter adapted for digestion and maturation, it turns it into the nature of blood and warms it, and in consequence innate heat is engendered, and travels through and warms the whole body. (6) If there are hot bilious humours, and the period of sleep is prolonged, the body grows *warm by extraneous heat*. (7) If at the time of sleep the stomach is empty, the sleep will exert *a cooling effect*, in that it disperses the heat. If at the time of sleep there is a humour not amenable to the digestive power, the sleep will exert a cooling effect because of that to which this humour gives rise.

Factor associated during the time of sleep.	Effect on body.
Profuse sweating.	Accumulation of nutrients.
Gastric contents digestible.	Completion of digestion and blood-formation: formation of innate heat.
Hot bilious humour.	Formation of extraneous heat.
Empty stomach (fasting)	Cooled; heat is dispersed.
Indigestible humour.	Cooled; expansion of heat.

§ 193. Aetius adds:

Among the good effects of sleep are : forgetfulness of mental sufferings, rectification of the distracted powers of reason ; relaxation of contracted tissues.

The best time for sleep is after a meal ; it should end when the food is digested (shown by percussion over the stomach), after which the bowels should be emptied.

The best time for sleep during the 24 hours is the night, because the humidity and drowsy stillness of night contribute to perfect digestion. The worst time is the day-time, because in that case one does not sleep long enough to enable the digestion of the food to be completed. The result is acidity, flatulence, gurgling in the bowels.

338. *The waking state* acts in the contrary way in all these respects. If it occur to an excessive degree, the temperament of the brain changes to a certain dryness, with weakening and confusion of the reasoning power, oxidative changes in the humours and acute illnesses resulting. An excessive degree of sleep, on the other hand, exerts an opposite effect, for it dulls the powers of the mind, induces heaviness of the head and a cold intemperament. This is owing to the hindrance of resolution which such sleep brings about.

339. The waking state (1) disperses the matter, and so increases the appetite and sense of hunger ; (2) disperses the digestive power, and so impairs digestion.

During the waking state the body becomes hot exteriorly, cold and dry interiorly (Joannitius).

Insomnia (lit. tossing about in bed), a state between watchfulness and sleep, is bad for all the bodily states.

340. Undue somnolence entails an imprisonment of the innate heat, and makes the body become cold exteriorly. This is why so many blankets are needed to keep the limbs warm during sleep, which are not required in the waking state.

The indications furnished by somnolence, and its various aspects, and states, will be fully dealt with in subsequent volumes, Allah willing.

14. THE INFLUENCE OF PERTURBATIONS OF MIND.

341. Changing states of mind (nafs), and the associated " motions " of the breath are either interior or exterior, sudden or gradual.

When there is coldness interiorly, it moves outwards with the breath ; hence if the breath were suddenly dispersed, the coldness becomes excessive, and both exterior and interior cooling occur, which may be followed by syncope or even death.

When there is coldness exteriorly, and heat interiorly, the coldness moves inwards with the breath.

342. Great confinement of the breath, with both exterior and interior cooling, results in severe syncope and even death.

Movement of the breath.		Direction.	Associated emotion.
Sudden and forcible	Expansion.	Outward	Anger.
Gentle and gradual	,,	Outward	Delight and moderate joy.
Sudden and forcible.	Contraction	Inward.	Fear, terror.
Gentle and gradual.	,,	Inward.	Gloom ("contracted heart") mental depression.

343. Confinement and dispersal of breath only occur suddenly; languishing of breath only develops by degrees. By "languishing" I mean a slowly progressive confinement or coarctation of the breath. When I say "the nature declines,"* I refer to a gentle, gradual, step by step dispersal of the vitality.

344. If two motions of the mind occur simultaneously, the breath may move in two directions (contraction within itself, and enlarging) at once. This happens (1) when there is fear, dread, and anxiety about the future. (2) when anger and gloom occur simultaneously. The two opposite movements may produce a sense of shame, because there is first the confinement of the breath in the interior parts, and after that the power of reason returns, and resolution appears, allowing the contracted breath to expand again, and bring heat to the surface. The skin now becomes red.

345. *Influence on the body of mental disturbances of a different category.* The state of the mind of the parents affects the body of the offspring; as for instance, phantasies. As a rule, it is some natural object which impresses the body. For instance, some image of a boy pictured by both parents at the time of conception may be realised in the infant when born; or the infant's breath may have a "colour" very like the colour seen (mentally) by the mother whilst the seminal fluid was flowing into her at coitus, or by the father during the time of this flow.† Many persons hate to believe such things, and suppose they can understand the states of the body without having realised the fundamental state. The physician who seeks wisdom does not deny these and allied things.

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* See footnote to **199** (ii).

† Superficially, the suggestion that conception is synchronous with coition would seem an instance of mediæval ignorance. Costaeus, in annotating on the passage, accepts the opinion that a strong desire on the part of either parent to see self or partner repeated and reproduced is capable of securing that the conception shall yield a child in whom the desire is ultimately realized. Favourable patency of the internal ducts (cervix, etc.), whether anatomically or emotionally, in association with voluntary control of supposedly purely involuntary muscular tissue, are co-operative factors whereby the above suggestion is not error but sometimes fact. The law of jelal and jemal plays an important part which is ultimately, in due time, manifested by the sex of the product of conception. Thus when the male is jelal

346. Other instances of the influence of the phantasy on the bodily state : (a) a movement of the mind which is intent on considering red things induces a corresponding state of readiness for a movement of the sanguineous humour. [Exanthems may be associated with such a movement of sanguineous humour (Costaeus)]. (b) energetic character : eating acrid things : hardening of the teeth. (c) introspective character : dwelling on aches and pains in the limbs : aches and pains in the limbs. (d) timid character : fearing lest some imagined event should happen : change of temperament corresponding. [Fear of catching a certain complaint : actually developing the disease (Costaeus)]. (e) hopeful disposition : rejoicing in the thought of something one would like to realise : change of temperament corresponding.

DIETETICS

15. THE INFLUENCE OF FOOD AND DRINK.

"Most illnesses, even those which lead the sufferer to the specialist, arise solely from long-continued errors of diet and regimen."

347. Food and drink influence the body in regard to (*a*) quality ; (*b*) material composition ; (*c*) "substance" as a whole.

It is essential to define each of these three terms exactly.

(*a*) *Influence in regard to quality.*—Heating and cooling food and drink respectively make the body hot in virtue of their own heat ; cold in virtue of their own coldness ; and yet these qualities do not become an integral part of the body.

(*b*) *Influence in regard to material composition.*—The food and drink in this case change from their own nature, so as to receive the "form" of one or other of the human members (tissues) ; and the matter of which the food is composed receives the "form" of the member, without losing its own dominant primary quality right through the whole process of digestion

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the product is female, and vice versa,—the jelal or jemal relating not only to physical affection, but to "anguish of love" ; and the physiological cycles in the two organisms have also to do with the chances of conception. The subject is dealt with more particularly in the fourth Book, in a form which is only apparently obsolete.

The belief that maternal mental states affect the growing embryo, both physically and psychically, is natural, though rejected by some physicians. It is a valuable saying that "we can control the attributes and thoughts of the offspring and give it a far more valuable inheritance thereby than by any material fortune." It applies as an admonition to both parents.

"The woman produces an offspring like that being upon whom her thoughts dwell at the time of conceiving."—(Charaka-Samhita, ii. 704.)

By contemplating on beautiful scenes of nature, beautiful pictures, pious persons, etc., the mother contributes to make her child beautiful and virtuous and possessed of other desirable qualities (*ib.* 745)

The whole subject bears on the causation of deformities, or malconformations (**496**).

to the end of assimilation. Thus, the temperament of lettuce is colder than that of the human body, and yet lettuce becomes blood, and is thus capable of being converted into tissue. The temperament of garlic is hotter than that of the human body and it also becomes blood.

(*c*) *Influence in regard to "substance" as a whole.*—The specific "form."—This is an action according to what food is in itself, as apart from its four primary qualities, and apart from whether it becomes like the tissues or not, or apart from whether the body becomes like to it or not. Matter does not enter into action in virtue of its quality of action. But action ensues in virtue of its matter when the matter is changed by a transforming faculty in the body, from the substance it originally possesses, and (1) first renews whatever has been used up in the body, and so (2) increases the innate heat in the blood. Then (3) the effect of the primary qualities which remain in the food after that comes into play.

348. Action occurs in virtue of the substance when the "form" of its "species"—resulting from its temperament (for the elementary components are intermingled, and one single thing emerges therefrom)—is made ready for receiving the species; a certain "form" is now super-added over and above the form possessed by the primary qualities. But this "form" is neither (1) the primary qualities of the matter, nor (2) the temperament proceeding from those primary qualities. This "form" is that perfection which the pattern of the ailment receives according to its capacity, and its capacity is the outcome of its temperament. Example: the attractive faculty of the magnet; the nature inherent in the various species of plants and animals (the nature emerging from the temperament). Nor is this "form" (3) any of the simple temperaments by themselves, for it is not hotness, moistness, dryness, or coldness, either alone or in combination. Really speaking, it is something comparable with colour, odour, or intellect, soul, or some other "form" imperceptible by the senses.

349. The "form" which arises after the temperament has formed may be perfected by passive action. In this case the "form" = "passive property." But it may also exhibit active perfection. In this case "form" = "active property" (active principle). This active property may be exerted upon a human being, or it may not.

350. Any property may produce an effect on the human body which is either desirable (useful, harmonious) or undesirable (inharmonious). Such an effect is not entirely derived from its temperament ; it is also derived from the specific " form," over and above the temperament. Hence we speak of such an effect as derived from the substance as a whole (that is, the " specific form "), and not from any of the primary qualities or from a temperamental intermingling of the qualities. For instance, the action of peony in annulling epileptic seizures is desirable. The action of aconite in destroying human " substance " is an instance of undesirable action.

* * *

351. Returning from our digression, then, when we say that a substance which is eaten or is introduced hypodermically (*e.g.* by inunction) is " hot " or " cold," we mean not only that it is so virtually (not actually), but that it is virtually hotter or colder *than are our bodies.*

352. " *Power*," " *potentiality*," is a term with two kinds of meaning. (a) It may be used in reference to the action of the innate heat of the body upon it. As soon as the potentiality encounters the action of the innate heat it submits to that, and so becomes act.

(b) The word potentiality may also be considered in reference to its utility or advantage to the body. Thus we say that sulphur is hot in potentiality (" virtually hot ").

353. When we say that a thing is hot or cold, we may mean that one of the four imponderables is dominant in its temperament ; and we do not refer to the effect which it has on our bodies.

354. We may say that a certain medicine has such and such a potentiality, thereby meaning its utility or otherwise to the body. Thus, a scribe who has stopped writing still has the potentiality for writing. So we say that aconite has a destructive potentiality. In the one case, there is no act till after the body has become evidently changed. In the other, the action occurs at once, from the mere presence of the agent (*e.g.* viper poison), or some time later, after it has undergone some certain change in quality (*e.g.* aconite).

(c) Between these two potentialities there is a third—that of poisonous medicaments.

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355. There are four *orders of medicaments*—whether eaten, or taken in the fluid state, or whether given by inunction.

1. The *first degree.* The action of the quality of a medicament on the body is imperceptible to the senses. Thus,

a warming or cooling effect is not perceived by the senses unless it is given repeatedly, or in larger dose.

2. The *second degree.* A greater degree of action, without perceptibly interfering with the functions of the body or changing their natural course (excepting incidentally, or because given in large doses).

3. The *third degree.* There is evident interference with function, but not markedly enough to produce breakdown or death of tissue.

4. The *fourth degree.* Destruction or death of tissue is produced. This is the degree produced by poisons. A poison is lethal in all respects (that is, in all parts of its " substance ").

§ 194. (Another classification would be (*a*) medicaments which produce change without destruction of function or tissue, (*b*) those which actually destroy function or tissue. In each case there are two degrees—one imperceptible to the senses, the other plainly evident.—This is Galen's grouping. The grouping into four degrees still survives in the classification of burns.)

Substances which are definitely poisonous may be classified into four groups as follows:

(1) *Corrosives.* These produce immediate and violent irritation. Ex.: mineral acids, alkalis, corrosive sublimate.

(2) *Irritants*: (*a*) *Metallic*, such as lead, copper, arsenic, phosphorus; (*b*) *Vegetable*, such as drastic purgatives (aloes, colocynth, croton oil); (*c*) *Animal*, such as cantharides. This group produces effects which simulate natural disease, such as gastric and intestinal disease, peritonitis, abdominal catastrophe.

(3) *Neurotics.* Ex.: hydrocyanic acid and the cyanides, opium, strychnine, aconite, belladonna.

(4) *Gaseous.* (*a*) Irritant: halogens, ammonia; (*b*) Anæsthetics; (*c*) Coal-gas, carbon monoxide, etc.

There is another group classifiable under **355,** 1 and 2, exemplified by common salt, which is injurious or even toxic in cases of kidney disease ([141], p. 390); and by those foods against which some persons have idiosyncrasies, or " protein sensitiveness " (shell-fish, fruits, etc.).

356. *Fate of medicaments taken into the body.*

A.—They are changed by the body (passive change).	
(i.) The body itself is not changed nor restored to health	
(*a*) Medicament changed into the likeness of the body -	pure nutriment.
(*b*) Medicament changed, but not into the likeness of the body - - - - - -	attempered medicine.
(ii.) The body itself is also changed (active action).	
(*a*) Change in medicament produces change in body, and interferes with or even arrests function.	
(*α*) the change is into the likeness of the body -	medicinal food.
(*β*) not into the likeness of the body - - -	pure medicine.
(*b*) The change in the body continues till life is destroyed - - - - - -	venomous medicine.
B.—They are not changed at all by the body, but they produce a (deleterious) change in the body (active action on the body) - - - - -	pure poison.

Ad. B.—In saying a medicament is " not changed by our body " we do not mean that it does not induce a formation of heat in the body by affecting the innate heat, for, as a matter of fact, most poisons only act on the body in that way, thereby producing warmth. We mean that its "form" is not changed, and that in consequence its power continues to influence the body until the latter has destroyed the "form." For instance, if the nature of the medicament be hot, its nature reinforces its property of dispersing the breath. Examples: viper venom; aconite. Again, if the medicament be cold, its nature reinforces its property by congealing or enfeebling the breath. Ex.: scorpion venom, hyoscyamus (or, hellebore).

Ad. A. i.a.—Anything that is nutritious will eventually change the temperament of the body, and in a natural manner. It warms the body because when it becomes blood that is the natural effect; and the body becomes warmer. Lettuce and gourds warm in this way. So in saying "warm" we do not mean "warm the 'form,'" but "warm that which arises out of its own intrinsic quality—the 'species' remaining."

Ad. A. ii. a.—Medicaments which are foods are altered by the body first in quality, and later in "substance." This change in quality may be in respect of heat, so that the medicament warms (e.g. garlic); or it may be in respect of cold, so that the body becomes cold (e.g. lettuce). Afterwards, when the digestion and conversion into good blood has been completed, the medicament produces warmth to the same extent to which it has added to the volume of the blood, thereby increasing the "substance" of the innate heat. How could it do otherwise than furnish heat when it has itself been made hot, and its coldness thereby abstracted?

But even after the medicament has been changed in substance there still remains some of its innate quality (some hot, some cold). There is some of the coldness of the lettuce left in the blood which has been made from the lettuce, and there is some of the heat of the garlic left in the blood which the garlic has given rise to. This holds good for a certain period of time.

357. Some nutrient medicines are medicinal in quality rather than nutrient, and others are nutrient rather than medicinal. Some of the latter are more like the "substance" of blood in nature (e.g. wine, egg-yolk, meat-juice), and others are less so (e.g. bread, meat) and others are entirely different to the substance of the blood (medicinal foods).

Food changes the state of the body both in quality and quantity. Changes in quality have been discussed.

358. *Changes in quantity* are in two directions. Either the nutriment increases in the body until there is an aversion to food; obstructions therefore arise, and putrescence results.

Or it diminishes in amount until the body wastes away, and the tissues dry up.

An increase in amount of nutriment is always cooling in effect unless decomposition supervenes in it, so giving rise to warmth. This warmth, due to putrescent changes, is extraneous ; for such changes [in the superfluous nutriment] are the means by which extraneous heat [as opposed to innate heat] enters the body.

359. CLASSIFICATION OF FOOD-STUFFS.

(This passage is arranged in tabular form).

Texture of nutriment.	Nutritious quality.	Name of Aliment.	Notes.
Attenuated (i.e., produce attenuated blood).	Rich.	Meat juice, wine. Eggs (raw or lightly cooked). Pottage.	These are considered rich in nutriment because most of their substance is utilized by the body.
	Poor.	Potherbs. Juleb. Fruits (matian, pomegranates, and the like).	These are attempered in substance and quality.
Dense (i.e., thicken the blood).	Rich.	Hard-boiled eggs ; veal.	
	Poor.	Cheese, salted meat, egg-plant and the like.	These are considered poor in nutriment because only a small portion of them becomes blood.

360. ARRANGED ACCORDING TO QUALITY OF CHYME.

1. Making good chyme : egg-yolk, wine ; meat-juice, are highly nutritious ; they are attenuated.

   Lettuce, matian, and pomegranate are feebly nutritious. These are attenuated.

   Boiled eggs, year-old lamb are highly nutritious. These are dense in texture.
2. Making bad chyme : newly-killed meat of sucklings, pheasant, partridge, lung ; these are highly nutritious, and attenuated.

   Radish, mustard, and many other kitchen-herbs ; these are nutritious, and attenuated.

   Veal, duck, horseflesh ; these are highly nutritious, and dense in texture.

   Salt meat is feebly nutritious and dense in texture.

It will be easy to find the foods which occupy an intermediate position between the attenuated and densely textured foods.

§ 195. The study of food should include the following aspects.

(1) *Digestibility.* This depends on the density or tenuity of texture of the food-stuff, as well as on the materials with which it is

associated. Thus the more fat-content, or fat-addition (from foods combined with it), the less digestible, because the less permeable. Again, digestibility may be completely removed by so simple a procedure as taking certain liquids (among them, pure water) at an unsuitable time after digestion has begun, or liquids which are incompatible with certain foods before digestion, or in a state of partial digestion. Avicenna's conception of the gastric contents as a " broth " or " emulsion " is legitimate, and if these contents are " torn off " the mucosa by foods or fluids taken after the digestion of the meal has got under way, the whole process may stop beyond power of renewal. The same holds good for the process in the small intestine. This idea, ruling in the Canon, can be verified by anyone in his daily experience.—Palatability has to do with digestibility.

(2) *Assimilability.* This depends on the kind of chyme which will result.

(3) *Nutritive value.* This, according to the Canon, will depend on the kind of " humour " which the food yields ; how much residue it leaves (therefore, whether constipating or relaxing). Thus we have the classification of foods, according as they (1) enrich the blood: cereals ; dairy produce, such as soft boiled eggs, milk ; fleshmeat ; fowl ; certain vegetables. (2) Enrich the serous humour : mutton, pork, one-year lamb, the potherbs atriplex and purslane. (3) Increase the amount of bile made, or excite a flow of bile : chicken, fish with few scales and agile in habits, the potherbs garlic, mustard, nasturtium. (4) Increase the amount of atrabilious humour : goatflesh, newly-killed meat, cabbage, lentils. In each class there would be subdivisions according to the digestibility—whether digestible within two hours, or four hours, or later.

(4) *Physiological value.* This is a more general aspect, in that the other aspects contribute to its assessment. The old division of foods into proteins, carbohydrates, fats, salts, water is not necessarily to be rejected in favour of the modern division of foods according to energy-values, heat values, and " accessory factors." Chemical analysis of foods suffers from the fallacy that the substances so found do not exist as such in the food—a statement based on the same principle as will be discussed more carefully under the subject of " drugs." Moreover, were these substances present as such, they certainly do not circulate in the body, or function in the tissue cells in the chemical form found under artificial conditions. Physiological values may be assessed according to whether an ash is left in the tissues after oxidation or not. Thus, body-building foods leave an ash, heat generating foods do not. The important matter is the formation of ash, because of the risk of this lingering in the body, or even becoming firmly imprisoned in its tissues. Foods may also be studied in regard to their depurative properties, according to their alkalinity or acidity, etc. See also **768, 773, 795,** and §§ 248-252.

Thus there are other considerations than the popular ones of work-production, and the practical objects which rule properly only in the management of domestic animals.

16. The Various Kinds of Drinking Water.

Note the very great importance which the Moors attached to proper water-supply. Having been accustomed to the life of the desert, they appreciated the value of water better than any other peoples.

361. Water is the only one of the elements which has the special property of entering into the composition of food and drink—not that it is itself nutriment (although it will by itself prolong life for some time), but rather that it enables the aliment to penetrate into the human body and permeate and purify its substance.

We do not wish to imply that water does not nourish at all, but we mean that it is not, as nutriment is, potential blood giving rise ultimately to tissue-substance. As an elementary substance, it is not changed in state in such a way as to become able to receive the " form " of blood or of tissue. This can only occur with a true compound.

362. Water is really a " substance " which helps to make aliment fluid and attenuated, so that it can flow easily into the blood-vessels and out of the excretory channels. Nutrition cannot be effected without it ; it is the handmaid of nutrition.

There is much to be said as to the part played by water in the economy. Though apparently simple, its chemical structure is complex. It is a mixture of units of varying molecular complexity, each unit being called a "hydrone." The number of molecules of hydrone and polyhydrones constantly varies, even at steady temperatures, so that equilibrium regarding them is easily disturbed. The foreign matter always present in the water of Nature is essential to life, assimilation being only possible in virtue of such constituents. Apart from this, water is essential to metabolism—absorption, digestion (enzyme action depends on it), osmosis, temperature regulation, the maintenance of the salt concentration of the blood at a constant level. The necessary reservoir of water in the tissues is furnished by the muscular tissues, and their depletion has serious consequences (**502,** § 274-279), and their repletion entails important interference with the physiological functions. It may be noted however, that the idea that plentiful consumption of water "flushes" organisms out of the body is not reliable. (Hemmeter, Med. Rec., May 22, 1920.)

363. The various kinds of water differ (1) not merely in the substance of aquosity, but (2) in admixed matters, (3) their own individual dominant primary qualities.

364. The best water is that from springs, provided they arise in places uncontaminated by extraneous qualities. Waters from rocky places are only good if they are not admixed with earthy matters of putrescible nature which might cause the water to putresce. Spring water from the open ground is healthier than water from a rocky place, provided it is flowing. But not all flowing water is good ; it must be also exposed to the sun and winds. Water acquires nobility from the region whence it flows.

365. Stagnant water is not as bad in quality when exposed to the air as when it is deep underground. Yet running water is not necessarily exposed to the air ; it is only so when it breaks out from underground and flows out over the soil. Note, too, that water running over soil is more wholesome than that which runs over stones, because the soil cleanses it by filtering off the admixed extraneous matters in a way which stones do not. But the soil must be open to the sky ; it must not be fetid or boggy or nitrous, or the like, for should a large volume of water flow rapidly over such soil, the admixed matters would pass into its own nature. If the direction of the flow were eastwards, and in summer, it would then be reputed as better in quality, especially the further away from its source it is collected. Such water readily becomes warm or cold in the body. The next best water is that which runs northwards. Such water passes slowly through the stomach and is indigestible, and becomes warm or cold in the body only slowly. Water which runs westwards or southwards is bad, especially if the winds are southerly at the time.

366. Water which comes from high regions and has other good qualities is more healthy. It is sweet, as it were. It will not bear being mixed with wine except in small amount, and unless the wine is light. It quickly becomes cold and quickly warm because its " substance " is attenuated. That is why it is cold in winter and warm in summer. It is tasteless and has no odour. It passes out rapidly as urine, because whatever there is in it which requires digestion is rapidly digested and dispersed.

367. You must note that the quickest *way of assessing the quality of a water* is by its *weight*. Light water is healthier in all respects. The weight may be ascertained by measure or by means of the following procedure. Soak a linen cloth of like weight in each of two waters to be tested. Dry thoroughly. Weigh. The water belonging to the cloth which is lighter is the more satisfactory.

The *characters of pure water*, therefore, are: (1) *Aspect*: limpid,[32] clear, pellucid, " diaphana."[32] (2) *Taste*: tasteless, or " sweet,"[32] pleasant to drink, and refreshing. (3) *Odour*: none. (4) *Touch*: soft, or gentle[32]; cool.[32] (5) Other properties: weight (**367**); vegetables boil quickly in it; the place from which it is obtained is neither too hot nor too cold; " fertilizing " and " calm " (Honen[32], p. 633); passes out of the body quickly (**366**).

368. *Purification of water.* Bad water may be purified by sublimation and distillation. If that is not feasible, boiling will suffice, for boiled water, as the learned know, is less likely to cause inflammation and passes more rapidly through the body. Ignorant persons believe that when water is boiled the attenuated part is dispersed, and that therefore it is made denser; hence they think it is better not to boil water. But as you know, the very nature of " water " means that its particles are alike in attenuation and density. It is pure, simple [in the scholastic sense], and will not thicken by boiling except in virtue of a cold quality being dominant in it, and of earthy particles being plentiful in it, which, although extremely minute, are not easily separated out or precipitated. They are not plentiful enough to break the continuity of the water and are too small to separate out by standing. Hence they are bound to remain admixed with the substance of the water. Boiling removes the density which the quality of coldness produced; the particles of water are then forcibly rarefied and the substance of the water becomes more and more rare, until the heavy earthy particles hitherto suspended burst loose and fall down and sink to the bottom. A nearly quite pure water remains behind.

369. That which has been separated by the distillation is like (or very nearly like) in texture to that which remains behind, for the particles of the water which has been distilled off are of the same tenuity as the particles of that which remains. The process of boiling does not attenuate or rarefy water directly ; it does so only because it allows the cold quality to aggregate, after which the admixed matter settles out. The proof of this is that if a thick water be left to stand for a long time, hardly anything settles out of it, but as soon as one boils it there is an abundant precipitate and the water becomes light and clear, because the boiling has made it rarefied. So, too, have you not noticed that the waters of such a big river as the Jiḥon,* especially if collected a long way from its source, are very muddy at the time, but in a short time suddenly clarify by sedimentation, and if you pour off the clear water and leave that standing, practically nothing settles out of it ?

370. Some people praise Nile water very highly. They enumerate four virtues in it : (1) the length of time which has elapsed since it left its source ; (2) the good character of the soil of the countries through which it travels ; (3) the fact that it runs from due south to due north, so that a continual rarefaction of its waters is taking place ; (4) the incredibly enormous volume of the water pouring into it.

371. If one should pour bad water every day from one vessel to another, one would see as much deposit on the last day as on the first. There is so little deposit during a day that it never clarifies properly. The reason is that the admixed earthy particles easily separate out from rarefied matter, for that is free of heaviness, viscosity or oiliness, but not so easily from dense matter. Boiling increases the rarefaction and so do the shaking-movements incident to ebullition.

Commendable Waters.

372. *Rain water* is the best of waters, especially when it falls during summer or during a thunderstorm. [Others say the rain which falls in the spring, and that which falls during winter are best, then that which falls during the fruit season, whereas that which falls in summer is worst.] Rain falling during stormy weather is very polluted and impure in nature, for at this time the violent winds agitate those clouds whence the rain comes.

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* The river Jiḥon, or Oxus (modern Amu Darya), is one of the great rivers of Central Asia. It runs through the country of Khorasan, between Samarcand and the country called Bactria, as stated in the Glossary to the Venice edition of the Canon. Arising in the enormous glaciers of the mountainous ranges between East Turkestan and Afghanistan, and receiving important tributaries from the northern slopes of the Hindu Kush, it emerges into open country, being here bounded by Bokhara on the north. It varies from 1,000 yards to a mile in width in this region, and the stream flows from 2½ to 5 miles an hour. It empties into the Sea of Aral. So great a river would naturally be prized by the Persians, who regarded it as the equal of the Nile. The fact that the great trade route of Central Asia from Khorasan to China joined this river in the above-mentioned region made it well-known to Avicenna, though virtually unknown to Europe until 200 years later, when Marco Polo and his companions entered this country.

373. Rainwater readily undergoes putrescence in spite of being called laudable. This is because it is so rarefied that corruptible terrene matter and air quickly act upon it and set up decomposition in it; the humours of the body therefore undergo putrescence, and obstructions arise in the chest and the voice becomes husky.

374. Some say that the reason for the putrescence is that rain water is formed from the vapours which evaporate off from various kinds of moisture. But were this the case, rain water would not be laudable but uncommendable, and that is not so. The real reason is that the substance of rain water is very rarefied and tenuous, and when a substance is tenuous it has more receptivity (and is therefore liable to putrescence). But if boiled promptly, this risk of putrescence is lessened. (Aegineta adds : rain water is very light, sweet and limpid ; it is tenuous because it has been drawn up by the heat of the sun, and therefore only the lightest particles of sea-water, lake-water enter into it). Rain water is soft to the touch.

375. *Well water and water conveyed along aqueducts.* These are of bad quality as compared with spring water, because they are confined and have been exposed to earthy matter for a long time, and consequently cannot help being to some extent putrescent. For in the process of being drawn, they are shaken up by the power entailed (that is, by the mechanical contrivances used) or by the influence of gravity rendered possible by the slope of the channel. Of such waters those which are conveyed by leaden pipes are more harmful, because they acquire certain properties from the lead, and this makes them liable to bring on a form of dysentery.

376. *Snow water and water from melted ice.* These are coarse in texture. When pure and free from admixture with deleterious substances, such water is good and healthy ; it is also useful for cooling water, either by placing such water in it, or by adding it to the water. There is little difference in the visible character of these two kinds of water ; but they are denser in texture than other kinds of water [because the finest particles are squeezed out by the freezing (Aegineta)]. This kind of water is harmful for persons suffering from neuritis. Boiling renders such water wholesome. If ice water be made of bad water or if the snow has attracted some bad property from the places upon which it has fallen, it would be better to use water free of such injurious admixture.

River water was preferred before others by Rhazes; Aetius preferred Nile water to all others (see **370**).

Spring water: the qualities vary according to whether the water comes from north, south, east or west (Hippocrates).

NON-COMMENDABLE WATERS.

377. *Marshy water*: This is of worse quality than well water because it stays a long time putrefying in the channels of the decomposing earth, and diffuses out and moves up very slowly, and then not by its own power, for it is so rich in (alluvial) matter. Moreover, it only occurs in decomposing decaying earth. Well-water on the other hand is cleansed by contact with that which separates out from it and by the gases which bubble up out of it, thereby keeping it in constant (molecular) movement. Well-water does not remain in a confined state long and does not linger in the channels and openings of the earth.

378. *Stagnant water*: Water in reedy marshes. This is unhealthy and heavy, especially if in exposed situations, for these do not become cold in winter unless and only in so far as snow happens to fall on them. They therefore give rise, in the body, to serous humour. In summer, the sun makes them hot and so they putresce and then they will give rise, in the body, to bilious humour. There are three reasons why they cause disease: (1) their inspissated character; (2) admixture with earthy matter; (3) dispersion of their subtile particles.

379. The following are the diseases liable to develop after drinking such water: (a) diseases of the spleen. These result in heaping up of the viscera and stretching of the peritoneum—the belly being hard and tense; wasting of the arms, legs and neck—for the nutrition fails because of the state of the spleen despite the excessive appetite and thirst; constipation; vomiting is difficult to induce. (b) dropsy: from retention of the water. (c) inflammatory deposits in the lung and spleen. (d) dysenteric ailments, with the result that the hands and feet become dry, and the liver becomes enfeebled and nutrition is impaired. (e) quartan fevers (in summer). (f) piles, varices, lax swellings of inflammatory nature, insanity (especially in winter).

380. *The effect of such water on women.* Conception and parturition are both difficult. The offspring will be male and will be liable to develop inflammatory masses and then waste away.—Moles are liable to occur because impregnation is often faulty ; the offspring is found to have rupture.—Varicose veins and ulcers of the leg ; these heal with difficulty. The appetite increases and there is constipation leading to intestinal ulceration. Quartans are common.

381. Effect on old persons. " Ardent " fevers occur, as accords with the dryness of their nature, and of the stomach.

382. All stagnant waters, from whatever source, are injurious to the stomach.

383. *Channel water.* This is very like stagnant water, but is healthier because it does not linger so long in one spot. If it is not actually flowing, this was because of some heaviness in it. In many of these waters (i.e. including water in aqueducts, water in irrigation channels) there is a certain stypticity, and they quickly warm the interior organs. Hence they are not utilisable in cases of fever or for persons in whom the bilious humour is predominant. They are more applicable for cases of disease where the treatment is to foster retention and maturation.

384. *Waters containing metallic substances.* These are injurious, though in some cases there is a certain value in them. Thus, ferruginous waters impart strength to the internal organs, prevent stomach trouble, and stimulate the appetite. They resolve the spleen and are beneficial for those who cannot cohabit properly.

Waters containing salts of ammonia are aperient, and carminative. They may be either swallowed as a drink or given as an enema, or used in a sitz-bath.

Waters containing alum suppress excessive menstruation and haemoptysis and the bleeding of piles. But they render persons who are liable to take fevers still more liable to develop them.

385. *Waters in which leeches live.* These are injurious.

386. *Salt water.* This makes the body dry up and become wasted. Its abstersive power makes it first laxative, and afterwards constipating—because dry in nature. It decomposes the blood and so gives rise to pruritus and "scabies."

387. *Acetous water*, added to rain water which has to be consumed arrests putrefactive changes in the water and provides immunity from such ill-effects.

388. *Milky water* gives rise to calculus and obstructions. Hence one should make use of diuretics after it. In fact, one should take diuretics after drinking any coarse and heavy waters, because they linger in the bowel. Fatty and sweet things (e.g. theriacs) are also correctives for such water. The fact that milky water brings on constipation makes it of value for some persons.

389. *Cold water.*—Water which is only moderately cold is more healthy than all others, because it stimulates the appetite and strengthens the stomach. Nevertheless it weakens the nerves and is harmful for cases of inflammatory disease in the interior organs.

[*Very cold water* should be taken after food and then only in small quantity (Aegineta).]

390. *Tepid water* incites nausea.

Warm water (that is, water which is a little warmer than tepid water), taken on an empty stomach, is cleansing both to stomach and intestines. But it has a weakening effect on the stomach if taken often.

Hot water is beneficial for the following conditions:

(*a*) Head: "cold" headache; inflammation of the eye; parotitis, quinsies; "dry" gums; postauricular inflammations. Mental conditions—epilepsy and "melancholia."

(*b*) Chest: asthma, solutions of continuity in the thorax; ulcers of the diaphragm.

(*c*) General: rheumatic pains. Diuresis. It relieves painful micturition.

(*d*) Female ailments: it evokes menstruation.

Hot water interferes with digestion and makes the food swim about in the stomach. It does not quench thirst. It may lead to dropsy, and hectic fever, and emaciation.

Very hot water is of great value in colic; it also disperses flatulence.

391. *Aerated waters*: these are useful for certain intemperaments.

When various kinds of water, good and bad, are commingled, their effect varies according to which proves dominant.

392. *Correction of impure water:* The correction of impure water is specially referred to under "regimen for travellers"—see **891**.

Note also the following, from Aegineta: (1) add decoction of chick-peas; (2) boil wild carrots with some small fish and fennel; (3) beet, gourds, salts and diluted wine. Marshy, saltish and bituminous water should be strained. Fetid smelling waters should be boiled or mixed with wine.

When good and bad waters are mingled, the stronger dominates.

Other matters relative to water and its properties and modes of action will be discussed in the chapter on "Water as one of the simples" in Book II—Allah permitting.

17. THE RESULTS OF RETENTION AND EVACUATION.*

393. The following are the causes of retention of waste matters: (1) weak expulsive faculty, (2) unduly strong retentive faculty: the latter occurs in (*a*) weakness of digestive power, so that aliments remain too long in the stomach, the natural retentive faculty holding them back till they are sufficiently digested, (*b*) narrowness and (*c*) obstruction of the channels, (*d*) coarseness or viscidity of the waste matters. The former holds in the case of (*a*) superabundance of the waste matters, so that the expulsive faculty cannot deal with them, (*b*) insufficient informing sense for defecation, this act being aided by voluntary effort. The result may be that the effete matter is (compensatorily) removed to other parts of the body by the action of the vegetative faculties. Thus jaundice follows [gall-stone] colic; the colic depends on the retention, the jaundice is the compensatory evacuation. Again, at the crisis of a fever, there may be retention of urine and faeces, and a critical evacuation occurs elsewhere.

394. *Diseases consequent upon retention of waste matters.*—(i) Compositional: constipation, diarrhoea or laxity of the bowels, spasmus humidus and the like; inflammatory processes; furuncles. (ii) *Intemperaments*: septic conditions; imprisonment of the innate heat, or mutation of this into igneity. There may be so marked a coarctation that the innate heat is extinguished altogether, and coldness of the body supervenes, with the transference of too much moisture to the surface of the body. (iii) *General conditions*: tearing or rupture of locular spaces and crypts.

When repletion (as from great plenty during fertile years) develops after a long period of inanition (as from times of great famine, in barren years), it is one of the most effective causes of such illnesses.

395.—The *causes of the evacuation* (*depletion*) of matters which are normally retained. (1) Vigorous expulsive faculty, (2) defective retentive faculty, (3) unfavourable quality of the matter: (*a*) too heavy, because superabundant, (*b*) too distending owing to flatulent action, (*c*) corrosive and acrid in quality, (*d*) attenuation of texture making it too mobile and too easily expelled, (4) widening of the excretory channels. This occurs in the case of the seminal flow. It also occurs if they are torn longitudinally or transversely, or because their orifices become too patent (in epistaxis) from either extraneous or interior causes.

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* Cf., repletion and depletion (**442, 497, 502**).

396.—The possible *effects* of evacuation of this type are :

(1) The temperament becomes cold, because the matter is lost which would otherwise increase that which maintains the innate heat. (2) The temperament becomes hot, if the evacuated material is cold in temperament, like serous humour or mucus. (3) The temperament becomes equable like blood, if there is undue accumulation of the heating bilious humour, so that the heat becomes superabundant. (4) The temperament becomes dry. This is always intrinsic in origin. (5) The temperament becomes moist in a manner analogous to that mentioned in regard to accidental increase in the body-heat. Namely, either the evacuation of desiccant body-fluid has not been too great, or the innate heat is too scanty, with the result that the aliment is not adequately digested, and serous humour becomes relatively increased. But a moist temperament of this kind is unfavourable to the maintenance of the innate heat, and foreign heat will not serve as a substitute for innate heat, because of the difference of its nature.

397. The effect of excessive evacuations on the members of the body.—(1) Coldness and dryness of their substance and nature ensue, even though they receive extraneous heat, and moisture beyond their need. (2) Diseases : obstruction of the vessels due to undue dryness and narrowing of the veins. Convulsions and tetanic spasms may therefore arise.

398. When retention and evacuation are equally matched, and occur at the proper times, they are beneficial, and maintain the health.

§ 196. *Venery. Coitus.*—Galen placed this in the first rank among the obligatory causes of disease, but most physicians group it partly under " exercise," and partly under " evacuations " (excretions).

It causes " dryness " of the body ; weakens the vegetative faculties ; infrigidates (usually). Sometimes the concomitant emotional excitement entails a heating effect. (JOANNITIUS).

Having now given a general description of the obligatory causes of disease, we proceed to the facultative causes.

B. 18. *FACULTATIVE CAUSES OF DISEASE.*

We now come to causal agents, not necessarily injurious, to which the body is not inevitably exposed. They cannot be classified either as natural or as contrary to nature. They influence the body from without. Excluding the atmosphere, to which one is necessarily exposed, such agents are referred to as baths, friction, and the like.

399. Influences on the human body from without act in these ways :

I. By penetration into the body (**400-414**)
  (*a*) Attenuated matter in the pores enters the body by its own penetrative power.
  (*b*) The tissues themselves draw it in through the pores.
  (*c*) One of these factors assists the other.

II. The primary quality of the agent itself is able to produce a change in the body. (**415-431.**) There are three aspects of such a quality :

  (i) It may be actual, e.g., an epitheme of cooling character ; a plaster which is calefacient.
  (ii) It may be potential. Here the innate heat stirs up the power into actuality.
  (iii) A specific property.

III. Things acting in both ways (*a*) producing a harmful effect both externally and internally. (*b*) Harmful when applied externally, but not when taken internally ; and vice versa.

Example of an agent which affects the body when applied externally, but harmless when taken by the mouth : onions applied as a plaster cause ulceration ; as food, they are harmless. Example of an agent of a contrary kind : white lead. This is a virulent poison when swallowed, but is harmless when applied as an ointment.

Explanation of this.—(1) When a substance like onions is taken as food, the alterative faculty breaks it up and changes its temperament into a weaker one, until it is too weak to exert a harmful influence. Hence there is no internal ulceration. (2) When taken as food, such a substance is usually admixed with other foods. (3) Its power is broken by being submerged in the other moist substances present in the alimentary canal. (4) A substance applied externally can be kept in one spot, but when it is within the stomach it is kept moving about. (5) A substance applied externally is usually applied very tightly and closely, whereas within the body it is only just in contiguity without any adhesion. (6) When a substance is taken internally, its own natural power determines the quick accomplishment of digestion and quickly expels the excess left after the bulk has been converted into good blood.

The reason why the action of white lead is different is that white lead is of gross nature and is made of coarse particles. Hence it cannot penetrate into the channels of the body from without, and even if it did enter the skin it would not reach as far as the channels of the breath or the principal organs. Taken in by the mouth the matter is different, for then its poisonous nature is at once brought out by the influence of the innate heat upon it. Such an interaction could not take place externally.

We shall probably refer to these considerations again, in the Book of Simples. (Book II).

BALNEOLOGY

I

19. Baths. Friction. Exposure to the Sun.

§ 197. Points Relative to Water-Baths.

The bath-rooms : temperature of the air in the different rooms (temperate, warm, hot, cool) ; mural decorations.
The bath-man.
The bath itself :
  Quantity of water : full to immersion ; partial ; sitz, etc.
  Temperature of water : hot, tepid, cold.
  Duration of stay in the bath : long, short, medium.
  Kinds of water employed.
  Intrinsic quality (cooling, moistening, etc.)
The person bathing : relation to food : fasting or hungry ; immediately after a meal ; soon after a meal ; at the end of the first stage of digestion.
  State of the skin : dry, moist ; dropsical.
  State of the humours and their quality (cold, immatured).
  Frequency of bathing.
  Season for open-air bathing.
Effects of the bath :
  On respiration.
  On pulse.
  On innate heat.
  On the strength (relaxing effects ; syncope ; impotence).
  On the humours : helping maturation ; drawing to surface ; diverting superfluities to different parts.
  On the quality of the body ; dry, cold, moist.
  On the general nutrition : making the body thin, stout, or weak.
Special purposes of the bath. Treatment of hectic fevers ; for affections of the stomach and spleen, etc.

400. Some say that bath-houses should be ancient fine buildings, with vaults and arches, and roomy, airy, spacious galleries, and furnished with sweet water. Others mention that the bath-men should arrange the degree of heat to suit the temperament of the bather.

§ 198.—The *bath-house*, the *hammam*, of Arabian life, agrees in manner with that described among the ancients (e.g. the Romans).

In Lane's notes to the "Arabian Nights," he gives the following description :—"The public bath comprises several apartments, with mosaic or tessellated pavements, composed of white and black marble, and pieces of fine red tile, and sometimes other materials. The inner apartments are covered with domes, having a number of small, round, glazed apertures, for the admission of light. The first apartment is the disrobing room (*maslakh*, or stripping-place : Burton). (Tepidarium, because the air is tepid.) In the centre of this is a fountain of cold water. Next the walls are wide benches or platforms, encased with marble. These are furnished with mattresses and cushions for the higher and middle classes, and with mats for the poorer sort. The inner division of the building occupies nearly a square : the central or chief portion of it is the principal apartment, or *hararah*, which generally has the form of a cross. In its centre is a fountain of hot water, rising from a base encased with marble, which serves as a seat. One of the angles of the square is occupied by the ante-chamber of the hararah. A second angle has the fire and the boiler over it. A third angle has a small chamber, containing a tank of warm water fed by a spout in the dome (cf. calidarium). The fourth angle has two taps side by side, one hot, one cold. A small trough is beneath, and before that is a seat (cf. frigidarium). The inner apartments are heated by the steam rising from the fountain and tanks and by the contiguity of the fire. The chamber of the first-named angle is not as hot as the hararah, and has a door intervening. This chamber is used for disrobing in cold weather.

"In their atmosphere, the four apartments of the Hammam represent the four seasons—Autumn and Summer, and Winter and Spring." (Night 452).

"The bather enters the hararah wearing wooden clogs, a large napkin round the loins, a second round the head like a turban, a third over the chest, and a fourth covering the back. The attendant removes the towels except the first, and proceeds to crack the joints of his fingers and toes, and several of the vertebrae of the back and neck ; kneads his flesh, and rubs the soles of his feet with a coarse earthen rasp, and his limbs and body with a woollen bag which covers his hand like a glove. After which the bather plunges into the tank. He is then thoroughly washed with soap and water, and fibres of the palm-tree, and shaved, if he wish it, in the fourth chamber. Then he returns to the antechamber, and here he generally reclines upon a mattress, and takes some light refreshment, while one of the attendants rubs the soles of his feet, and kneads the flesh of his body and limbs, previously to resuming his dress. During this period of rest, a pipe and a cup of coffee is often taken. The operations in the antechamber are the 'restorative friction' of the text and of Greek and Roman baths. Before the dress is resumed, oils or ointments are rubbed in, and fragrant powders sprinkled on the skin."

Rooms in the private baths of the Alhambra Palace. (*a*) The Sultan's bath. Through the archway on the left is seen (*b*) the Calidarium. The "rest-room" of the same suite is shown as an "initial" to **751**.

§ 199.—Sir Thomas Arnold, in his recently published work, "Painting in Islam,"[107] (1928, p.88) quotes some medical authors who speak of the propriety of mural decorations in the rest-room. (*a*) The ideal bath "should contain pictures of high artistic merit and great beauty, representing pairs of lovers, gardens, beds of flowers, fine galloping horses and wild beasts, for pictures such as these are potent in strengthening the powers of the body, whether animal, natural, or spiritual." (*b*) "All physicians, sages, and wise men are agreed that the sight of beautiful pictures gladdens and refreshes the soul, and drives away from it melancholic thoughts and suggestions, and strengthens the heart more than anything else can do, because it rids it of all evil imaginings." (*c*) "Beautiful pictures in bright, cheerful colours. These they divide into three kinds since they knew that there are three vital principles in the body—the animal, the spiritual and the natural. Accordingly they painted pictures of each kind, so as to strengthen each one of these potentialities; for the animal power they painted pictures of fighting and war and galloping horses, and the snaring of wild beasts. For the spiritual power, pictures of love and of reflection of the lover on his beloved, and pictures of their mutual recriminations and reproaches, and of their embracing one another; and for the natural power, gardens and beautiful trees and bright flowers." (*d*) "When in a beautiful picture harmonious colours such as yellow, red and green, are combined with a due proportion in their respective forms, then the melancholy humours find healing, and the cares that cling to the soul of man are expelled, and the mind gets rid of its sorrows, for the soul becomes refined and ennobled by the sight of such pictures."

401. *Natural action of the bath.* The air of the bathroom has a warming action, the water of the bath has a moistening effect on the body. The first change in the body is to cool and moisten ; the second is to warm and moisten ; the third is to make the body warm and dry. It is useless to listen to those who assert that water taken internally does not moisten the interior tissues.

402. *Changes and later effects of the bath.* These are (*a*) accidental, (*b*) essential.

1. *Cold air bath.*—This disperses the innate heat greatly, and so dries the substance of the tissues. It disperses the natural (normal) fluids very greatly, though it increases the extraneous fluids.

2. *Very hot water bath.*—The pores close ; there is goose-flesh. The moisture does not enter the body, and there is not much dispersal of the innate heat. But the water sometimes adds to the warmth of the body and sometimes cools it. To have the former effect, the water must be very hot.

3. *Subtepid bath.*—This cools and moistens the body. As the water cools down, the air of the bathroom becomes less warm, and the effect of the cooling in both directions to which the body is now exposed is to contract the abdominal viscera.

Cold bath.—When taken while fasting, it imparts warmth and moisture. If taken after a meal, it will make the body cold, and remove moisture.

Hot bath.—When taken while fasting, it is attenuant and refrigerant and does not impart moisture. If taken after a meal, the bath is heating and moistens the body.—(Hippocrates.)

Warm bath.—This relieves lassitude, is soothing, and has a warming and softening effect. It dispels plethora, and removes flatulence from wherever it may have lodged. It favours sleep, and promotes digestion.—(Haly Abbas.) It opens the pores. It induces plumpness of the body. It is beneficial for all—men, women, young, old, rich, poor. The best time for it is before food, and after exercise.—(Aegineta.)

403. The frequent use of such a bath will have a *refrigerant effect.* This is because (i) water is fundamentally cold in nature, and even warming of it will not ensure continuance of the "accidental" (scholastic significance) heat, the natural quality remaining, and this natural coldness enters the body and makes it cold. (ii) Whether hot or cold, water is still "wet," and wets the body (interiorly), so, imparting much moisture, it binds the innate heat even to the degree of extinction.* Consequently the body becomes cold.

Such a bath may have a *warming effect* if (*a*) the aliment previously taken has not yet digested, (*b*) there is a cold humour present in the body which is not yet completely matured. For the bath will help the digestion of the aliment, and the maturation of the humour.

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* As water quenches fire.

404. *State of skin at the time of the bath.*—If the skin be dry at the time of the bath, dropsy or relaxed conditions would be benefited. If the skin be moist to commence with, the bath will have a moistening effect.

405. *Duration of stay in the bath.*—Dryness results if the person stay a long time in the bath. This is partly because of loss of water by the sweating and with the dispersal of the breath so induced. A short stay in the bath will produce a moistening effect, if the skin be wiped dry before sweating begins.

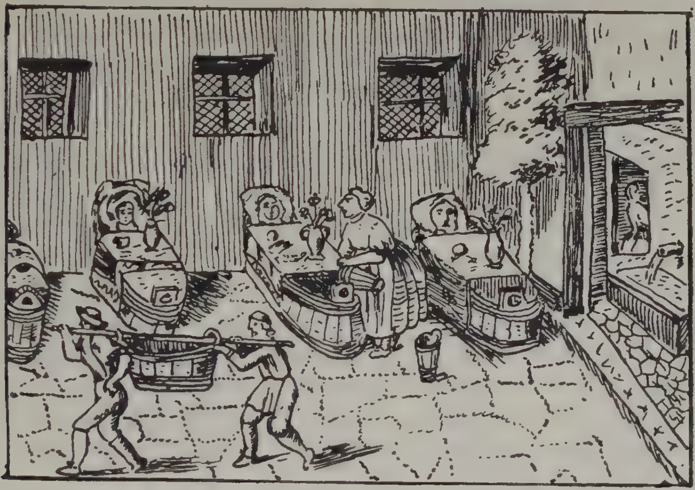
406. *Relation to meals.*—To enter a bath fasting will render the body extremely dry, and make the person thin and debilitated. To enter the bath after a heavy meal, on the other hand, will make a person stout, by drawing the humours towards the subcutaneous tissues. Moreover it removes the obstructions by transferring the undigested aliment from the stomach to the tissues. To enter the bath at the moment when the first digestion has ended and before a sense of hunger returns is beneficial and produces a medium degree of stoutness.

407. *Special therapeutic uses. Bath treatment of hectic fever.*—If the bath is taken for a moistening effect the person should be entirely immersed in the water, unless he is too enfeebled, or his strength will not allow of it. The air of the room should be temperate—neither hot nor cold, but gently moist. The water of the bath should be thrown freely about in order to disseminate the water-vapour through the air and so fill the air with moisture. The duration of the bath should not be long. The patient should be lifted out of the water and rubbed down gently, himself making no exertion ; and he should be laid at once on the couch (in the bathroom) and there be anointed with oil (to increase the moisture of the skin and retain in the pores the aquosity which has already gained entry into the skin, thus fixing it within the skin), using cool perfumed oil. He should then lie in the tepidarium (the disrobing room) for an hour until the respiration subsides to the customary rate. After that, he is anointed, robed, and taken into a room (dining-room, 1595 ed.) where he may receive a small draught compounded of humectants, such as barley water and asses' milk.

Disadvantages.—Such patients should not stay too long in the bath, as there is a risk of syncope, because it renders the heart "hot" (and therefore disperses the "breath") and sets the bilious humour in motion ; it produces nausea ; and other ill-effects. It causes morbific matters to gravitate into the debilitated organs. It has a relaxing effect and is injurious for the nerves. It disperses the innate heat. It removes the appetite for solid food. It weakens the power of sexual intercourse.

[Aegineta says: natural baths are largely desiccant and calefacient, and are therefore good for people of humid and cold temperament].

408. *Action of baths in virtue of mineral constituents in the water.*—Waters of this kind occur in nature, or may be reproduced artificially. They are all strongly resolvent and attenuant. They make the tissues flabby, and prevent humours from passing into abscesses. They are beneficial for the guineaworm and " Indian vein."



Mineral Baths in the Middle Ages[52] (p. 270).

Aluminous waters [Alum $=MgSO_4+FeSO_4$: " hair-alum," according to Adams[74]] benefit cases of hæmoptysis, melaena, menorrhage, procidentia ani or uteri, repeated causeless miscarriage, cachexias, undue sweating, causeless vomiting. They have a cooling and drying effect.

Bitter waters have a heating and drying effect.

Bituminous waters (" judaic waters ") occasion fulness of the head. The person must therefore not immerse his head in the bath or stay too long in it. They render the temperament warmer, especially that of the uterus, bladder and colon. They are all harmful and heavy. [They soothe if persevered with: Aegineta.]

Chalky waters have a cooling and drying effect.

Copper-containing waters are beneficial for the mouth, tonsils and uvula; for relaxed ocular tissues; for humid affections of the ears.

Ferruginous waters are beneficial for the stomach and spleen. (They should be entered gradually so as to allow the impression of the water to sink deeply into the body while it is in a relaxed state: Aegineta.)

Medicinal baths, prepared with laurel leaves, stavesacre, juniper berry.

Nitrous ($=Na_2CO_3$: Adams[74]) baths and saline baths are beneficial for the head and chest when humours are constantly flowing into them; for wateriness of the stomach, for dropsy, for swellings left after diseases, and for collections of phlegm.

Aerated waters, ferruginous and saline waters are beneficial for diseases depending on coldness and moisture, for pains in the joints, for podagra. They benefit relaxed persons, asthma, renal disease, carbuncles, ulcers; they are very beneficial in cases of fracture.

Sulphur baths. These soothe and warm the nerves and relieve pain, lassitude and convulsions. They cleanse the surface of the skin from furuncles and old bad ulcers and purple marks; they benefit pannus, vitiligo, lepra. They disperse morbific matters descending into the joints, the spleen and the liver. They are beneficial for the womb when unduly hard. They reduce the tone of the stomach and banish the appetite.

409. *Thermal baths.*—Persons desiring to use thermal baths should bathe quietly, gently, and allow the waters to play gently over the relaxed body; laving, not splashing; and in this way the interior organs are benefited.

The subject of baths will be considered further in Part III, and again when discussing the use of cold water as a drink.

20. THE INFLUENCE OF SUNBATHS; SANDBATHS; OILBATHS; SHOWERBATHS.

410. Immersion in hot sand, oil baths, spraying of water over the face; standing or running or walking rapidly, or jumping in the heat of the burning sun—all these are powerful agents for removing superfluities, and for producing sweating, dispersing flatulence, and lax swellings and dropsies. They are beneficial for asthma, for orthopnoea. They invigorate the brain (whose temperament is cold) and relieve inveterate "cold" headache.

If the seat of the bath is dry, and the floor is left wet, the bath will benefit cases of sciatica, lumbar pain, uterine obstruction. It has a cleansing effect on the womb.

411. *Sun-baths.*—One must not remain too long in the sun, or else the body will become dry, thick, and hard, as the sun acts like a cautery upon the pores of the skin, and obstructs the outflow of the insensible perspiration. The sun burns the skin more if one stands still in it, than if one moves about, and so it inhibits the dissipation of the sensible perspiration still more.

412. *Sea-sand baths, in the sun.*—These are more efficient for drying the humours lodged in the skin. Such a bath may be used in various ways: one may sit on the sand, or bury oneself in it, or sprinkle it over the body. In whatever way it is employed, the same beneficial effect is experienced in all the above-named diseases. If the sand is sprinkled over the body, little by little, it removes pains and other effects of insolation. In the end, there is an extremely marked drying effect on the body.

413. *Oil-baths.*—These are beneficial in lassitude and for persons suffering from long-standing cold fevers, especially if there are pains in the nerves and joints; for convulsions; for spasmodic diseases; for suppression of urine. The oil must be made hot outside the room. These baths are more beneficial for the above conditions if the flesh of the jackal or hyæna is boiled in it. If made as described, it will be an efficient remedy for joint-pains and podagra.

Aetius gives: add a fifth part of heated oil to the water. Such a bath is highly anodyne; it relieves lassitude and nervous pains. Uses: for prolonged fevers; for convulsions; for retention of urine.

414. *Shower-baths, Douching, Spraying.*—If water be sprinkled on the face (or over the body) it restores the vigour of the breath, when that has been lost by dyspnoea and by the inflammatory changes in hot fevers. This sprinkling is especially beneficial for syncope, if rose water or vinegar be used. It may restore the appetite. They are injurious to persons suffering from catarrhs or "cold" headaches.

"He swooned away, and the Wazir sprinkled rose water on him, till the Prince came to himself."—Night, 720; Burton, iv. 408.

Douching with emollient herbs is referred to in **719**, **732**.

II

THE AGENTS WHICH ALTER THE SEVERAL QUALITIES OF THE BODY.

1. Calefacients.
2. Refrigerants.
3. Humectants.
4. Desiccants.
5. Agents causing changes of form.
6. Agents causing obstructions of channels.
7. Agents which open up the channels.
8. Agents causing roughness.
9. Mollificants.
10. Agents causing displacements of parts.
11. Agents preventing apposition of parts.
12. Agents preventing expansion of parts.
13. Agents causing abnormal movements.
14. Causes of numerical increase.
15. Causes of numerical decrease.
16. Causes of loss of continuity.
17. Causes of ulceration.
18. Causes of inflammatory swellings.

19–26. The subject of pain.

27. Agents producing retentions or evacuations.
28. Causes of over-repletion.
29. Causes of debility; asthenia; lack of vigour in members.

415.—1. *Calefacients.*

(i) Outward heat in various forms: summer heat; artificial heat; baths of moderate temperature (the heating effect is produced by both air and water); calefacient plasters or local applications.

(ii) Heat produced by movement. Exercise, but not in excess; gymnastic exercise which is not too vigorous or beyond the right measure and duration; moderate friction; light massage with the hands on the limbs; dry cupping (wet cupping is infrigidant because it removes heat from the body).

(iii) Heat introduced by the mouth. Adequate supply of nutriment; hot aliments; hot or heating medicaments (i.e. viâ oxidation within the body.)

(iv) Heat arising from emotional states: anger, gloom in a degree less than would cause infrigidation; moderated joy. Also sleep and wakefulness in moderate degree.

(v) Heat derived from putrefactive processes. This is neither the innate heat nor derived from combustion. The warming from the innate heat is less in degree than that from combustion; it can occur apart from putrefaction and prior to a septic state. In the case of putrefaction the heat from the foreign source lingers in the body after the agent giving rise to it has left the body. This heat unites with the moisture of the humours and alters their temperament (in respect of moisture) in such a manner that it will no longer respond to the temperament of the natural breath. The difference between digestion and putrefaction is that in the case of digestion the heat and moisture which are present in matter are altered; that is, instead of being accordant with the original temperament, they are now accordant with another different one (*p*).

In oxidation, moist substance is separated from dry by sublimation and evaporation, the dryness going into the residue.

In the process of simple calefaction, the humours simply become warmer without losing their natural breath.

(Galen's classification into five groups is represented by i, ii, iii, iv and v of the above list.)

(vi) The state of the body. When there is sclerosis (takāthuf) of the surface, the body tends to become hot because the breath (lit. the steam, bakhr) is held in or imprisoned. When there is rarefaction (takhalkhal) within the body, it becomes warm because the " breath " (bakhr) then expands throughout the body.

The above section has been partly rearranged. The sub-headings are introduced, as usual, for the sake of clearness.

Sclerosis.—This refers to the thickening of the skin, which occurs after long exposure to the weather ; it becomes harsh, coarse, and presumably less pervious.

Steam.—Horses " steam " when they have been hard-worked. The exhaled air appears like " steam." The urine and shed blood steam when they leave the body. This steam is the *substance of the breath*, so that it is permissible to translate the word accordingly. This steam, which pervades organs and tissues and tissue-spaces and cavities, is the visible manifestation of the breath.

It is natural to think, then, that if the skin is so hardened that it will not let this vapour out, the latter will accumulate in the body and make it hot, as happens after severe exercise until the body " cools down." It is also natural to reason that if the vapour is able to expand owing to laxity of the connective tissues, it will impart a sense of glow to the body ; for everyone has experienced it.

Rarefaction.—When this term is applied to the skin it refers to a condition opposite to " sclerosis " ; the skin is unduly soft, supple, and is evidently relaxed instead of tight.

These considerations apply to sub-heading 5 of **416.** See also **838.**

§ 200. In modern language, the warmth of the body depends on the relation between heat loss and heat gain. Heat enters the body from (*a*) the external air or surroundings : warm air of summer, artificially warmed air in winter, baths ; (*b*) heat derived from (i) food and drink, (ii) exercise, (iii) toxic action of foreign matter (sepsis, drugs) ; (*c*) heat fostered by preventing heat loss : clothing, sleep ; (*d*) local heat (fomentations, etc.) ; (*e*) emotional influence.

Heat is lost from the body by (*a*) excreta : urine, faeces, skin action, exhalation by the air expired ; (*b*) external conditions : cold, wet.

Note that baths vary in their effect. An ordinary hot bath (105° F.) renders the body warm ; a brief immersion has a different effect, a long continued immersion is depressant.

416. 2. *Refrigerants.*

1. Artificial cold ; this is a refrigerant in act, as it is cold itself.

2. Potential refrigerants. Thus, when the body is hot at the time of exposure to the agent, its heat becomes dissipated. Thermal waters.

3. Calefacients. (*a*) Excessive : very hot air, thermal waters, hot plasters and fomentations (which disperse the innate heat by

relaxing the body); (*b*) moderate: staying too long in the bath; (*c*) agents at present hot but becoming cold later.

4. Excessive exercise: this disperses the innate heat unduly. Excessive repose aggregates and strangles the innate heat, thereby having an infrigidant effect.

5. Certain bodily states. (*a*) Great rarefaction relaxes the body and disperses the innate heat; (*b*) extreme spissitude strangles the innate heat; (*c*) excessive retention (has the same action); (*d*) undue evacuation from the body, which destroys the material basis of the innate heat and disperses the breath, and allows the effete matters to become obstructions.

6. Mental states: great gloom, too much fear; too much joy; great delight.

7. Aliment. Excess of food and drink; cold aliments; too little food; refrigerant medicines.

8. Mechanical causes: tight bandaging of limbs for some time, which prevents the innate heat reaching them.

9. Crudity; the opposite of putrefaction.

(Galen's classification was: 4, 1, 3*a*, 5*b*, insufficient food.)

417. 3. *Humectants.*

External: baths, especially if taken after a meal.

Diet: food taken to excess; humectant articles of food; humectant medicaments.

Retention of that which should be evacuated.

Evacuation of desiccant humour.

Repose and sleep.

Joy in moderation.

Infrigidants (these cause the humours to be retained); calefacients (slight degree of warmth causes the humours to move).

418. 4. *Desiccants.*

External: cold congeals the humours and prevents the tissues from attracting nutritive material; it also constricts the channels of the body, and so causes them to be blocked; in consequence nutrient material cannot reach it.

Great heat disperses moisture. Hence too frequent hot baths have this effect.

Bathing in styptic waters has a desiccant effect.

Diet: insufficient food; dry aliments; desiccant medicaments.

Violent evacuations; coitus.

Exercise.

Wakefulness.

Frequent emotional disturbance.

419. 5. *Agents causing deformity.*

Some of these agents come into play from the beginning of life, because of a defect in the formative power of the sperm. Others come into force later in life—namely at parturition, during the act of traversing the maternal passages. Others operate after birth (tight binders and wrappings). Others operate in infancy, before the limbs are hard enough to enable the infant to walk (letting the baby fall; blows).

Diseases which characteristically produce deformities: leprosy, paralysis, nerve-lesions, phthisis.

Excessive deposition of fat; an excessive degree of emaciation (due to inflammation, or malposition, or from the coalescence of ulcers).

420. 6. *Agents causing obstruction of the channels.*

(i) Foreign bodies in a channel: calculus. (ii) Too great a quantity of material in a channel: loading with faeces. (iii) Alteration in quality of material: grossness, viscosity, leech-like coagula of blood. (iv) Formation of matter within the channels, whether removable therefrom or becoming fixed therein. (v) Obliteration of the orifices, (*a*) by cicatrisation after healing of an ulcer; (*b*) by formation of new tissue (e.g. proud flesh, fleshy warts); (*c*) by compression by an inflammatory mass in the vicinity; (*d*) by the astringent effect of great cold or dryness (styptics); (*e*) by unduly marked retentive power; (*f*) by tight bandaging.

Obstructions are common in winter, because that is the season when effete matters are largely retained, and because the cold itself has an astringent effect.

421. 7. *Agents which open up the channels.*

Channels become dilated either from lack of retentive power or from an excessive action of the expulsive faculty. For example, holding the breath. Medicines which are relaxing, hot, moist, aperient and detergent.

In short, all agents contrary to Group 6.

422. 8. *Agents producing harshness of the body.*

A medicinal agent may render the body harsh by its sharpness (acidity), like vinegar and acetous waste matters; or by dispersion (like halcyonium=coral) and acrid waste matters; or by styptic action (which produces roughness because it is dry; ex.: bitter substances).

Infrigidants have this effect, by inspissation.

Terrene substances sprinkled over a limb like a dusting-powder may exert such an effect.

423. 9. *Mollificants.*

(Fatty or) glutinous substances act in virtue of their viscidity; agents which mildly disperse the humours by attenuating them, cause them to flow, whilst at the same time they carry off the dense particles of matter in the apertures on the surface of the member.

424. 10. *Agents which produce displacements and luxations.*

Displacements of parts are produced (1) by extension—a force dragging on the member and pulling upon it until it is dislocated; (2) by some unexpected violent movement, aided by the throwing of the whole weight of the body upon the member (e.g. luxation of the foot); (3) by some laxity or moistness in a part. This happens in tearing, in corrosion, or septic change or destruction of the substance of a ligament or nerve—e.g. in elephantiasis, sciatica.

425. 11. *Agents which prevent parts from becoming apposed.*

Here belong—congenital factors; grossness; viscosity; looseness of joints; dryness of humour in a joint; spasm; ulcers which are only partially healed; calculus.

426. 12. *Agents which prevent parts from expanding.*

Here belong—congenital factors, coarseness, spasm, cicatrisation after healing of ulcers.

427. 13. *The causes of abnormal movements.*

(1) Dry intemperament may cause weakness (e.g. dry tremor) or spasm (e.g. dry hiccoughs, or spasm). (2) Effete matters which heat, or cool the surfaces of the muscles. (3) Interception of the power which should have access to a member owing to some form of obstruction. (4) Nocumental effete matter acting in virtue of its coldness (e.g. rigor), or in virtue of pricking property (e.g. shivering), or in virtue of interference with the innate heat, making it either scanty or submerged, so that the surfaces of the muscles become cold, and gaseous matter forms which seeks to be dispersed or expelled. (Ex.: jerkiness, jactitation.)

In such nocumental matter, further, gaseous matter may be deficient. This gives rise to the desire to stretch oneself. Or, gaseous matter may be in excess; and in this case, if the matter be quiescent, one form of lassitude arises; if the matter be mobile, other forms of lassitude will arise, which we shall describe later (**821**). If the nocumental character of the matter be more decided, shivering ensues. If very strong, rigors and spasmodic contractions come on. Should such matter which is held back in the muscles be gaseous, jactitation or pulsatile movements arise.

428. 14. *Causes of increase in size of body.*

Abundant supply of aliments; great vigour of attractive faculties acided or not by friction or by calefacient plasters (e.g. plaster of pitch and the like). A powerful formative faculty will increase both the size and the number of tissue-components: e.g. proud flesh, supernumerary fingers. If pathological material* be formed, tumours, ganglia, "atheromas," steatomas, and warts will form. (Costaeus, quoting Galen.)

15. *Causes of numerical decrease.*

(1) Congenital: matter* lessened in amount; faulty or defective formative power. (2) Acquired: lack of nutrition during lactation or later; direct injury—cutting wounds, blows, mechanical destruction of tissue; frostbite; internal causes—eroding ulcers, septic processes.

429. 16. *Causes of loss of continuity.*

(1) Intrinsic: Pathological body-fluids, having a consuming, burning, moistening, relaxing, drying or cleaving action. Fluids which pierce and force themselves into tissues and stretch them apart. Gaseous matters also may force their way into, and stretch, tissues. In each of these cases, the effect produced depends on (*a*) the force of movement, (*b*) the abundance of the fluid or gas, (*c*) the greatness of the expulsive power.

Similar in action to these are: vociferation, leaping exercises; opening of abscesses.

(2) Exterior. Traction by a rope or weight; incision by a sword; burning by fire; contusion by a stone; rupture of a sac by contusion; perforation by an arrow; punctured wounds (scorpion wounds); bites by a mad dog, a viper, or a human being.

430. 17. *Agents producing ulceration.*

The rupture of an inflammatory mass; of a pustule; of an abscess. The bursting out of an ulcer.

431. 18. *The causes of inflammatory swellings.*

Causes relative to the material in a member: superabundance of the four humours; aquosity; gaseous matter.

Causes in regard to the condition of a member. (1) Expulsive power. (2) Weak retentive faculty, which disposes it towards harbouring waste matters. This varies with (*a*) the nature of the organ or tissue (e.g. the skin is so created); (*b*) the texture of the member (the looseness of the flesh behind the ears, in the neck, axilla, and groin is favourable—to deposition of matter); (*c*) the width of the passages and orifices—too great and too narrow respectively; (*d*) low position of outlet; (*e*) small outlet, so that the food residues cannot get away. Some nocument may impair the power to digest the food material coming to the part. Blows may cause the matter to be retained in a member. Lack of exercise may prevent matters from being dispersed as they usually would be. Too much heat in a particular region may attract inflammatory processes—whether it be the natural heat of the flesh or an unnatural heat (causing pain) or heat produced by excessive exercise, or by some calefacient agent.

Inflammation may follow fracture, if the limb has also been contused or crushed or stretched when setting the bone-ends.

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* i.e., humours.

Inflammations often occur in connection with the teeth, as food may collect in them, undergo infusion, and so become putrefied. This may lead to an abscess.

19-26. *The subject of pain.*

These separate Chapters are here gathered into one, with the following subdivisions :—

i. General discussion of the causes of pain.
ii. Theory of the nature of pain.
iii. List of the types of pain, and the explanation of each.
iv. Agents which alleviate pain.
v. The effect of pain on the body.
vi. The causes of pleasurable sensations.
vii. How movement brings on pain.
viii. How depraved humours evoke pain.
ix. How gaseous substances produce pain.

432. *General discussion of the causes of pain.*

PAIN is one of the unnatural states to which the animal body (as a sensitive and living thing) is liable. We begin with a general discourse about it.

Pain is sensation produced by something contrary to the course of nature, and this sensation is set up by one of two circumstances (*a*) a very sudden change of the temperament ; or the bad effect of a contrary temperament, (*b*) a solution of continuity.

In saying " the bad effect of a contrary temperament " we mean : the substance of the members of the body has a constant temperament, and then a foreign temperament of contrary character (hotter or colder) supervenes. The sensitive faculties become aware of the change ; this is " pain." The law is that *there is no pain save as the sensation of contrariety produced by a contrary thing.* A temperament which is constantly unhealthy does not produce pain, or arouse any sensation. That is to say, if the temperament residing in the substance of the members is bad, it destroys the original temperament so that the member is as if it had always had this unhealthy temperament ; consequently it neither produces pain nor is aware of it. The reason is that before sensation can occur, the sense organ must become affected by that which is sensed. But in this case the condition persists. There is no change. So there is no pain. Suffering will only occur if some contrary enters which is able to alter the temperament to one not previously present.

That is why a person suffering from hectic fever does not suffer as much as one who has a one-day or a tertian fever, despite the fact that the heat of the first is greater than that of the others. In the case of hectic fever the heat is persistent and situated in the substance of the principal members ; in the case of tertian, the heat comes from a hot humour, and so reaches those members which retain their natural temperament. Should the humour recede, the natural temperament will continue in the member, the heat not being fixed in it unless the fever become hectic.

No inequable intemperament persists in a member except according to a certain rule. Such a state may arise during the best of health. Thus, should a person plunge into a bath in winter, and lave himself with tepid water, he would shiver ; which shows that it is harmful. For the primary quality of the body is far from that of the water, and indeed contrary. Afterwards, however, it is beneficial and produces subjective satisfaction. The cold influence lessens step by step until no longer evident to the senses.

But suppose the person were to sit in the bath-house another hour, the water would make his body hotter. And yet in spite of that, if this same tepid water of the above bath were suddenly thrown over him unexpectedly, shivering would result and the water would seem cold to him.

If we study such things carefully, it will be clear that though unhealthy inequable intemperaments form one of the groups of causes of pain, yet not every one of such intemperaments actually does so. A hot temperament is in itself able to cause pain, and so can a cold one ; but a dry temperament causes pain only secondarily, and a moist one is painless. For heat and cold are both active qualities ; dryness and moisture are passive. So that in one case the impression on the body is active, in the other it is passive.

Dryness is a cause of pain secondarily, if another kind of agent comes into play, as e.g., loss of continuity. Dryness itself may be a cause of loss of continuity, in virtue of its power of producing great constriction of a channel.

433. *Theory of the nature of pain.* According to Galen, all this can be reduced to the one essential thing—loss of continuity and nothing more. A hot thing only causes pain by breaking continuity of a part ; a cold thing also only causes pain by breaking the continuity of function or of a part ; it exerts such an astringent and aggregating effect that the particles are drawn together towards a certain place and agglutinated ; and, in consequence separated off from their surroundings. In some of his writings, he seems to hold the opinion that all sensibles are deleterious from the very fact that in order to experience a sensation there must be a cleavage of particles one from another—agglutination of some entailing cleavage of others; the fact of cleavage accounting for the sensation called "pain." A black object which gives a painful impression to the sense of sight does so because its blackness is due to an extremely close aggregation of particles; whiteness is due to the particles being widely discrete.

A bitter, salt, or sour thing, which gives a painful impression to the sense of taste, does so because such things produce vigorous dispersion of particles. Pungent things do so because they aggregate very vigorously, and are therefore no doubt followed by dispersion. So too, with odours; and sounds—where the movement of the air impinging in the external auditory meatus gives rise to a painful sensation.

To explain it according to my own view:—It is the transmutation of the temperament of a part which determines the presence of, and the kind of, pain proceeding therefrom, whether there is loss of continuity or not. This is best proved by Natural Science, but the following brief explanation may be given here. We may therefore say:—

Pain occurs in a member which is of homogeneous structure. Solution of continuity cannot occur except in members which are not of homogeneous structure. Pain occurs in states of the body where there is no loss of continuity of particles. Hence loss of continuity is not a condition on which the appearance of pain depends. An intemperament will produce it. Cold produces pain if it constricts and agglutinates particles, and the part is cold throughout its substance; solution of continuity does not occur at the site of infrigidation but at the distal parts of the infrigidated places. Again, pain is the sensation of a sudden impression by the contrary qualities. It is the fact that they are contrary, that accounts for the pain.

Does one not observe how a person who experiences cold to a degree enough to alter the temperament will sense the change in his temperament and also feel pain without there being any question of loss of continuity? where indeed such a loss is impossible? It is clear then that a sudden change of temperament will cause pain just as loss of continuity does. Pain arouses heat, and affects the innate heat, and this makes the pain greater still.

After the pain has subsided, there remains a something which provokes the sensation of pain. But it is not really pain.

It is a sum-total of things which are undergoing spontaneous breakdown.

A doctor ignorant of all this, and striving to relieve the pain, may make wonderful mistakes, and fail in his object.

434. *List of the types of pain and the explanation of each.* There are fifteen kinds of pain* (rearranged alphabetically) :

1. Boring
2. Compressing.
3. Corrosive.
4. Dull.
5. Fatigue-pain.
6. Heavy pain.
7. Incisive.
8. Irritant.
9. Itching.
10. Pricking.
11. Relaxing.
12. Stabbing.
13. Tearing.
14. Tension.
15. Throbbing.

1. *Boring pain.* The cause of this pain is the retention of gross matter or of gas between the tunics of a hard and gross member (e.g., the colon) and so continually goading it and tearing its parts asunder, boring into the interstices like a gimlet.

2. *The pain of compression.* This is produced by fluid or gas, when it is confined in too small a space in a member, and so compresses or squeezes the tissues.

3. *Corrosive pain* proceeds from the presence of material between the muscle-fibres and their sheaths, stretching it till it breaks not only the continuity of the membrane, but also that of the muscle therewith.

4. *Dull pain.* The cause is threefold : (1) the temperament may be too cold ; (2) occlusion of the pores so that the breath (of the sensitive faculties) which should come to the member cannot do so ; (3) overfulness of the (locular spaces or) cavities.

5. *Fatigue-pain.* This is produced (1) by undue toil—laborious toil, (2) by a humour which produces tension (in tensive lassitude), (3) by a gaseous substance which produces inflative lassitude, (4) a humour of biting properties (ulcerative lassitude). These pains may arise out of various composite states, as has already been stated in the appropriate places.

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* In regard to the kinds of pain, it is of interest here to recall the *eight kinds of pain inherent in human life*, given in the Nirvana Sutra : (1) Birth pangs (Shoku : Japanese ; jātir-duḥkham : Sanskrit) ; (2) The pains of age (Roku : jarā-duḥkham) ; (3) The pains of disease (Byoku ; vyādhi-duḥkham) ; (4) The pain of death (Shiku ; marana-duḥkham) ; (5) The pain of parting with loved ones or things (Aibetsuriku ; priyaviprayoge-duḥkham) ; (6) The pain of meeting with what one dislikes (Onzoeku ; apriya samprayoge-d) ; (7) The pain of not obtaining what one seeks (Gufutokku) ; (8) The pain of the five elements ; that is, the body itself produces pain (Goonjoku). (The Sanskrit of the last two terms is lengthy).—Ishizuka's notes to Honen. [32] p. 446.

Lassitude as a result of several combined states, is called inflammatory lassitude, which is a composite of tensive and ulcerative lassitude (see **824**).

6. *Heavy pain.* In this case there is an inflammatory process in an insensitive member such as the lung, the kidney or spleen. The weight of the inflammatory deposit drags on the tissues and surrounding sentient fascia and on its point of attachment. As the member is dragged on, the fascia and its point of attachment experience the sensation. The cause of the pain may be that a sentient member has had its sensation destroyed by the disease, so that the weight is felt, but actual pain cannot be felt any longer (e.g., cancer at the mouth of the stomach).

7. *Incisive pain.* This proceeds from a humour of sour quality.

8. *Irritant pain.* This is produced by a certain type of change in the humours (harshness, roughness).

9. *Itching pain.* This is produced when a humour is acrid, sharp, or salt.

10. *Pricking pain.* The agent producing this is material similar to that which causes boring pain ; it is retained in an organ of similar type (to that which is the seat of boring pain) for a time and then ruptures it.

11. *Relaxing pain* proceeds from matters accumulating in and stretching the belly of a muscle—not its tendon. It is only called relaxing if the belly of the muscle is more lax than the nerve, tendon, or enveloping membrane.

12. *Stabbing pain.* This is the result of transverse stretching in membranes, as if their continuity were being separated, by a humour. It may be an equal or an inequal sensation. In the former case, all the members of the body are uniformly affected. In the latter case, there are four possibilities : (i) Inequality in hardness or softness between the tissue with which the membrane is covered and the membrane itself. Ex.: the clavicle or costal pleura ; in a case of inflammatory process travelling from the pleura towards the upper parts of the chest, the pain is felt in the collar-bone. (ii) Inequality of movement of the component parts (e.g., the diaphragm and the pleura or peritoneum over it). (iii) Inequality of nature between the parts and the member. (iv) Unequal distribution of nocument among the parts and the member affected, in that it affects one and not another.

13. *Tearing pain.* Proceeds from the interposition of

humour or gas between bone and periosteum, or from cold which strongly constricts the periosteum.

14. *Tension pain.* This is produced by a humour or gas stretching the nerve-fibres or muscle fibres asunder.

15. *Throbbing pain.* The cause is a hot inflammatory process. A cold inflammatory process, of whatever type, is either hard or soft, but sets up no pain unless it changes into a hot inflammation. Throbbing pain arises in a hot inflammatory process if the adjoining member is sentient, and has pulsating arteries round it. A member which is healthy does not sense their movement, because they are deeply situated, but their pulsation sets up pain as soon as an inflammation arises in the member.

435. *Agents which alleviate pain.* There are three groups of agents which alleviate pain : (1) Some contrary to the cause of pain—which removes the cause. Ex. : anethum, linseed, made into a poultice and applied over the painful place. (2) Any agent which counteracts the acrimony of the humours, or soothes, induces sleep, or dulls or soothes the sensitive faculties and lessens their activity. Ex. : inebriants, milk, oil, aqua dulcis, etc. (3) An agent which infrigidates and dulls the sensation in the painful part. Ex. : all narcotics and somniferous drugs. The first of the three is the most certain.

This subject is referred to again at the end of Part IV.

436. *The effect of pain on the body.* Pain dissipates the bodily strength and interferes with the normal functions of the organs. The respiratory organs are inhibited from drawing the air in, and consequently the act of breathing is interfered with, and the respiration becomes intermittent, or rapid, or altogether unnatural in rhythm.

The organs are first made hot, then cold ; this is because some of the breath and vitality is dispersed and escapes.

437. *The causes of pleasurable sensations.* The agents which produce pleasurable sensations fall into two groups. (1) Where an intemperament suddenly becomes equable and the senses become aware of the change. (2) Where there is a sudden restoration of the natural continuity.

Sensation depends on sudden change, whether painful or pleasurable. Pleasurable sensation is to sense harmoniously ; and this act of sensation is performed by the sensitive faculties. It is a *passive* act. One experiences pleasure or pain according as the sensation is harmonious or disharmonious. The fact that the sense of touch is the most elementary (crude) of all these senses accounts for it retaining the harmonious or disharmonious impress longer. When that which comes to the sense of touch is harmonious with nature, the pleasurable sensation is greater; and if the agent is disharmonious, the painful sensation is greater than would be the case with the other faculties.

438. *How movement brings on pain.* Movement and exercise induce pain when nerves are stretched thereby, or when muscles become contused or lacerated thereby.

439. *How depraved humours evoke pain.* Depraved humours evoke pain either by reason of their qualities (for instance, acridity), or by reason of their being abundant (thereby stretching the fibres of a tissue or making the organ heavy); or for both reasons together.

440. *How gaseous substances produce pain.* Accumulations of gas may become painful when they cause a part to be greatly distended. Gases may accumulate in (*a*) hollow viscera (e.g., in the stomach: gastrectasis); (*b*) the membranes over organs, or nerves (e.g., colicky pain from stretching of the nerves of the intestinal wall); (*c*) the sheaths of muscles, serous membranes, or periosteum; (*d*) the subcutaneous tissues (the place between the muscles and the loose fascia or skin); (*e*) internal members (e.g., the muscles of the thorax).

Gas may be dispersed rapidly, or only after a time. This depends on the amount, and whether coarse or fine, and whether the member itself is dense or rarefied in structure.

27. AGENTS WHICH BRING ABOUT RETENTION OR DISCHARGE.

441. It is easy to know the causes of retention or discharge if one ponders well over what has already been said about retentions and evacuations. The reader should therefore turn back and carefully re-read what has been written about it.

28. THE CAUSES OF OVER-REPLETION (PLETHORA).

Plethora.—"Passive congestion" is over-repletion with blood; it is associated with stasis.—"Active congestion" is the equivalent of 'waram,' "apostema."—Oedema is over-repletion with lymph (serous humour); it is associated with stasis in the lymphatic channels or serous cavities. The practical result is that the channels cannot drain or empty *within the available time.*—Hypertension is a form of plethora.—Corpulence is over-repletion with fat, namely in the connective-tissue spaces. One practical result of this is that supervening disease produces greater affliction than otherwise, as was written in the Charaka[156] (i. 236).—Plethora of the connective tissue spaces with a mucoid change in the fluid may produce the appearance of obesity. This peculiar change is met with in the female sex; it fluctuates in degree from time to time, and may appear or disappear within a few days.

Intestinal stasis is over-repletion of the large intestine.

It may be noted that the effect of stasis anywhere is to interfere with that flow of breath which is essential to health, or even life. The breath is "choked" or "strangled." The faculties are also at a disadvantage, for their free operation is conditional on free flow of breath through all parts of the body.—In modern terms, oxidative processes are retarded or arrested.

442. The causes are extrinsic and intrinsic.

1. *Extrinsic* (primitive). (*a*) A dietary (fluids as well as solids) which gives rise to much moisture beyond the needs of the body ; matter accumulates in the body, and interferes with the action of the emunctories. (*b*) Taking baths frequently, especially after meals. (*c*) Repose ; ceasing to take exercise ; ceasing to secure the usual evacuations. These prevent the resolution of material in the body. (*d*) Improprieties in eating and drinking ; depraved regimen.

2. *Intrinsic.* (i) Lack of digestive power, so that the aliments are not completely utilized. (ii) Feebleness of expulsive faculty. (iii) Undue vigour of retentive faculty, so that humours are caused to linger in the body. (iv) Narrowing of the excretory channels.

29. THE CAUSES OF ASTHENIA AND DEBILITY OF A MEMBER.

443. Weakness may affect (i) the body of the member itself ; (ii) the breath, which conveys power to it ; (iii) the faculty of the member.

(i) The following produce *weakness in the member itself :*

(*a*) A persisting intemperament, especially a *cold* one. For even though the member receive some heat, the cold intemperament produces an effect like stupor in it, because it breaks up the temperament of the breath—just as happens when a person stays too long in the bath, and especially when such a procedure brings on syncope. A *dry* intemperament has an inspissating effect, and acts by preventing the faculties from functioning in the member. A *moist* intemperament relaxes and obstructs.

(*b*) One or other of the composite diseases.

(*c*) The most important in all (in man) is neither nocument, nor malady, nor pain. It is an attenuation of texture in the peripheral nerve-fibres of the member, for both vegetative and voluntary actions depend for their achievement on these fibres in all their ramifications. The retentive power which is necessary to secure efficient digestion depends on the condition of these fibres in the stomach.

(ii) *Weakness of the breath itself.* This will occur if it be of bad temperament. There may also be dissipation of the breath, after an evacuation corresponding. It is also weakened by an abnormal mode of depletion.

(iii) *Weakness of the faculty.* This depends on the number of actions and the number of times they are repeated. The breath is dispersed at the same time. Moreover loss of breath accompanies every agent which produces asthenia.

444. The causes of asthenia may be classified in another way, so as to include the remote causes with them—the causes of causes. We then consider (i) causes of intemperament; (ii) causes arising from decomposition changes in the air, in water, and in the aliment; (iii) causes which cause the breath to escape, or become confused, or, as it were, shaken up. Nothing disturbs the breath, or causes it to escape as effectively as does a bad smell, such as the fetor from putrid water, or the presence of poisonous vapours in the air, or in the body. [Under such circumstances, the instinctive action is immediately to "hold the breath."]

445. *Evacuations as a cause of weakness.* For instance, loss of blood; diarrhœa, especially of thin attenuated fluid; the sudden withdrawal of copious dropsical effusions by paracentesis; the opening of a large abscess with sudden withdrawal of much pus—whether the opening is by nature or by surgical interference; excessive sweating; severe exercise.

446. *Severe pain* disperses the breath and may alter its temperament. The chief kind of pain likely to have this effect is that from distension, or incisive pain—especially in the pit of the stomach. Any pain in the region of the heart will disperse the breath.

447. *Fevers* should also be included among the causes of asthenia. They act either by dispersing the breath, or by loss of blood, or through producing a change of temperament.

448. Widening of the pores often aids in producing asthenia. Long continued semi-starvation has the same effect.

449. Weakness in one member or in a part of a member may cause weakness of the whole body, as is seen in the case of defective function of the cardiac orifice of the stomach, which produces general weakness of the body. Or, if a person suffers severely from some cardiac or cerebral trouble, shortness of breath rapidly supervenes on very slight provocation.

450. Further, a cause of weakness may be that one has endured many illnesses.

451. When one member is weaker than another from birth, or when it is by nature weaker in itself (e.g., the lung, or brain), then it is receptive for matters which the stronger members reject or discard, or eliminate. The brain would suffer in this way were it not for its position, whereby nothing comes to it which it cannot tolerate, even its virtues cannot persist there.

END OF THESIS II.

C. *Retributive or Expiative Causes of Disease.*

§ 201. The idea that illnesses were a form of "judgment" or punishment, or retribution for misdeeds, was formerly widespread, but is not regarded seriously in modern Medicine. In the case of all peoples who hold the Buddhist belief in karma, this ancient idea holds good because every event, good or bad, in the individual life is believed to be the outcome of events in a past life—whether in this particular existence or in a previous incarnation. Wherever the theosophical teachings hold, the same view would be held. Moreover, in Islam there is no difficulty in the idea because "there is no second cause," and as is written in the Mesnavi, in speaking of Izrail, the angel of death, God is said to "operate by disease and sickness, and men will not look for any cause beyond these diseases"—in virtue of the truth of text (Quran 56, 84) "He is nearer to you than ye are; yet ye see Him not."

Ghazzali, in his "Alchemy of Happiness" says: "illness is, so to speak, a cord of love by which God draws to Himself the saints concerning whom He has said, 'I was sick and ye visited Me not.' Illness itself is one of those forms of experience by which man arrives at the knowledge of God. As He says, 'sicknesses themselves are My servants, and are attached to My chosen.'"

During mediæval Christian times pandemics were regarded as the manifestations of divine wrath, and the incidence of illnesses is sometimes still explained in similar terms in modern Christianity, the microbic and other tangible causes of disease being taken simply as the instruments whereby the event is achieved. (Cf. § 113.)

As in the case of the idea of "fate" and "destiny," the subject is apt to be viewed incorrectly. Illnesses are sometimes evident warnings; sometimes they belong to the category of expiation, whether in relation to others or to the victim himself. In any case, diseases may be regarded as in some way connected with that experience of life which the sufferer has himself to undergo. In Thomistic terms, such would be the "final cause" of disease.

In the life of Saint Lydwine of Shiedam,[124] we read how a celebrated physician, Godfried de Haga, endorsed and deferred to "the divine law that every malady is an expiation; that if God does not regard the expiation as satisfied, the course of the illness cannot be altered by the art of medicine. Cure cannot result from his treatment unless his intervention coincides with the completion of the expiation which has been imposed on the patient by his Lord." *

In modern times this belief is manifested as a conviction in the pastoral instructions to the Catholic medical man that he is not entitled to continue his ministrations on a patient gravely ill unless his (Catholic) patient has fulfilled his spiritual duties within a certain number of days of the onset of the severe symptoms.

" Hay muchos decretos eclesiasticos que prohiben a los medicos visitar mes de tres veces, si el enfermo no se ha confesado."—(Vilariño, 142, p. 645.)

The following advice to the patient himself is less harsh to appearance : " first when thou feelest any indisposition, accept it as a dispensation of the love of My Heart. . . . Afterwards, unite thy sufferings with Mine. . . . If thy infirmity increases offer to Me thy body as a living victim. . . ." (Arnold, xvi)

This teaching leaves no room for doubt about the true answer to the oft-aired question, " should the doctor tell ? " (his patient that his illness is likely to prove mortal).

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* It was subsequent to the named physician's life-time that Paracelsus wrote the words actually quoted, adding " when the time for redemption has come, the patient will then find the physician through whom God will send him relief." Paracelsus classified the causes of disease under five headings : those arising in morbid states of the body ; those belonging to the category of poisons (intoxications) ; those arising from " astral " origins ; spiritual causes (passions, disordered thoughts, morbid imagination) ; and retributive.[28]*a* (p. 199, 221).

THESIS III. THE EVIDENCES OF DISEASE

1. General Remarks about Symptoms and Signs

> "The science of the diagnosis of disease by internal symptoms is founded upon six canons: (1) the patient's actions, (2) the waste of the body, (3) the nature of the pain, (4) the site of the pain, (5) swelling, (6) the effluvia given off by his person."—Night 451.[104]
>
> "A physician who is a man of understanding looketh into the state of the body and is guided by the feel of the hands, according as they are firm or flabby, hot or cool, moist or dry."—Night 450.

452.

BY means of the symptoms and signs of the three main states of the body (health, illness, neutrality), we obtain information as to the present, the past and the future of the patient's state. Knowledge of his present state, says Galen, is of advantage to the patient alone, showing him what he must do; knowledge of the past is advantageous to the physician alone, as proving him to excel in his art, so that his advice becomes worthy of respect (because reliable); knowledge of the future serves both purposes—it is advantageous to the patient because it guides him along the road he should follow, and it is advantageous to the physician in showing him to excel in his art.

The signs belonging to the first category are called "demonstrative"; those of the second category are "commemorative"; those of the third are named "prognostic."

453. *The signs of health.* (1) Those which denote an equable temperament. These are referred to in **494.** (2) Those which denote equability of the composite: (*a*) substantial: creaturely form, position, quantity, number; (*b*) accidental: comeliness, beauty; (*c*) final: (i) that is, fulfilling functions; (ii) fulfilled function.

Every organ is healthy whose functions are adequately performed.

The evidences that the functional state of the principal organs is adequate is shown by studying their activities. Thus the state of the brain is shown by the state of the voluntary power of movement, by the state of the sense-organs, by the acts of judgment; the state of the heart by pulse and respiration; the state of the liver by the character of the excreta and urine. (If the urine appear like the washings of fresh meat it shows that there is deficient liver-function.)

454. *The signs of disease.* 1 Some signs are *pathognomonic* of disease—thus: rapid pulse-rate, in fever, itself indicates fever. 2 Other signs indicate the *position* of the disease. Thus a hard pulse denotes diaphragmatic pleurisy; undulant pulse denotes inflammation in the substance of the lung. 3 Other signs indicate the *cause* of the disease. For instance, the signs of plethora, or of depraved states in their various forms.

4. Some symptoms are essential to the illness, as they begin and end with it. (For instance, acute fever, piercing pain, dyspnoea, cough and serrine pulse—essential to pleurisy.) Other symptoms show no time-relation of this kind; they sometimes coincide with the disease and sometimes not (e.g. headache in fever). Other symptoms appear only towards the close of the illness—as for instance, the symptoms of crisis, of maturation, of delayed maturation; the signs of death. These symptoms are often associated rather with acute illnesses.

5. Other symptoms concern the state of the members. Some of them are discernible by the special senses—colour, hardness, softness, heat, cold, and the like. Others are discernible by all senses together—the form of the member, its position (posture, attitude), its size, its movements, or stillness. Some symptoms point to an interior state, as when tremor of the lower lip reveals nausea. Changes in measure and number reveal internal states; for instance, shortness of fingers denotes small liver.

6. Morbid states are discernible by the special senses. Thus a black or yellow colour of the excrement reveals a morbid state. Black or yellow jaundice of the whole body reveals an obstruction in the biliary passages.

7. States manifested to the sense of hearing.—Eructations reveal gastrectasis, and defective digestive power.

8. Odours and tastes also enable one to become cognisant of morbid states.

9. Other visible evidences; curved nails denote ulceration

in the bronchi, phthisis and "hectic." Redness of the cheekbones suggests inflammatory deposit in the lung.

455. 10. *Movements* (*gestures*, *postures*, *attitudes*).—The states of the body are revealed by its movements, or absence of movement. (i) Motionlessness of the body as a whole—in apoplexy, epilepsy (coma), syncope, palsy. (2) Unusual movements: shivering, tremor, twitching, sneezing, yawning, stretching, cough, trembling, spasms (especially note in which member this begins); (i) some of these are physiological (hiccough); (ii) others are symptomatic (convulsion or spasm, tremor); (iii) some are voluntary (tossing about in bed; turning from side to side); (iv) others are partly voluntary, partly involuntary (cough, micturition, defecation); in some of these the voluntary is overruled by the involuntary (cough), while in others the voluntary overrules the involuntary (micturition and defecation, occurring too slowly owing to interference by the will); (v) involuntary movements. Some of these are evident to the senses (e.g. shivering), others are not (e.g. quivering, jactitation). These movements vary (*α*) in regard to their *nature*; thus, cough is intrinsically more energetic and powerful than quivering; (*β*) in *extent*: thus, the act of sneezing entails the use of more muscles than the act of coughing does; coughing is accomplished simply by the movements of the chest, sneezing entails movements of the head as well as of the chest; (*γ*) in degree of *associated mental anxiety*. Dry hiccough is associated with a greater degree of mental anxiety than the movement of coughing, though the latter is more vigorous, being reinforced by the natural faculty. In some cases the movement is aided by an essential primary instrument; thus, defecation is aided by the abdominal muscles; in other cases the aid is extraneous: thus, the natural act of coughing may be aided by the atmosphere; (*δ*) in *origin*. These movements vary (*a*) according to the member (cough, nausea); (*b*) according to the faculties involved (jactitation originates in the vegetative faculties; the act of coughing originates in the sensitive faculties); (*c*) according to the humour concerned (thus, cough proceeds from an excretion; twitching from a gaseous agent).

These are all evidences of conditions in the members and are chiefly external in character. Some of them reveal internal conditions; as, for instance, redness of the cheeks is a sign of pulmonary inflammation.

There are also (internal) evidences of external conditions, and to discern these a perfect anatomical knowledge is necessary.

456. One must have a proper knowledge of :—

(i) the *essential structure* of each member ; whether fleshy or not ; what is its normal form. One must know (*a*) whether the swelling for instance is according to the proper form of the member or not; (*b*) whether it is proportioned or not; (*c*) whether it is possible for anything to be retained within the given member or not; (*d*) whether that which is within (e.g. jejunum) can escape; (*e*) whether there can be retention in and also escape from the member ; (*f*) what the material is which can be retained in it or discharged from it.

(ii) Its *site*. From this one judges whether pain or swelling is actually in the part or at some distance from it.

(iii) Its *relations*. By this knowledge one judges whether pain is arising per se or reflexly from the surroundings, or whether the matter in an inflammatory mass arose in it or has entered into it from neighbouring parts. If it be a " superfluity " which escapes, is this the matter itself or is the affected member merely the channel by which the matter finds egress from the body ?

(iv) How to decide whether the discharge could have come from the supposedly affected member or not.

(v) The normal function of a member.—From interference with function one recognizes the diseased state.

This is the purpose of the study of anatomy. And a knowledge of anatomy is also necessary to enable the doctor to control diseases involving the interior organs.

457. The study of the significance of the symptoms of internal diseases should follow the following six headings :

1. *Interference with function.* The functions have already been described in regard to their qualities and degrees. The indications here are primary and constant.

2. *The discharges.* The indications here are constant but not primary. They are constant in that they are always associated with morbid states. They are not primary because they denote maturation, or interference with maturation.

3. *Pain*
4. *Swelling*
5. *Altered position*
6. *Special symptoms*

These are neither primary, nor constant.

458. Details about these headings.

1. *Interference with function.* When a function does not proceed normally, it shows that the agent at work is attacking the faculty itself, and the loss of function is secondary to disease of

the organ subserving that function. There are three ways in which function is interfered with: (*a*) impairment (e.g. failing eyesight, near sight, digestion impaired in rate or degree); (*b*) alteration (as when the eye sees that which is not there or perceives incorrectly; when the stomach digests food wrongly and causes it to decompose); (*c*) destruction (as when there is entire loss of vision; entire loss of digestive power).

2. *Significance of discharges and retentions.*

A. Retention of that which is normally discharged: retention of urine or fæces.

B. Abnormal discharge:
- (i) From the substance of a member
  - (*a*) itself diagnostic: Ex.: when a piece of cartilaginous tissue is coughed up; this is a proof of deep ulceration in the air-passages;
  - (*b*) diagnostic by reason of its dimensions or amount: passage of flakes in dysentery; if they are large flakes, the ulcer is in the large intestine; if fine fragments, the ulceration is in the small intestine;
  - (*c*) colour of the discharge. If urinary sediment is red, it shows the disease is in the fleshy organs such as the kidney; if white it shows the disease is in a muscular organ like the bladder.
- (ii) Not from the substance of a member:
  - (*a*) entirely unnatural. Thus healthy humours or blood should not be discharged at all;
  - (*b*) abnormal in quality. Thus depraved blood may be discharged physiologically, or not;
  - (*c*) abnormal in substance; e.g. calculus;
  - (*d*) abnormal in quantity: e.g. polyuria, oliguria, excess of fæcal discharge, paucity of fæces:
    - (*α*) abnormal in quality: black fæces, black urine;
    - (*β*) discharge by unsuitable or unnatural channels: e.g. passage of fæces by the mouth in cases of strangulated hernia.

3. *Significance of pain.*

(*a*) Its site: If right-sided, examine the liver; if left-sided, the spleen.

(*b*) Its type, which reveals its cause (see **434**; and the doctrine of causes). Severe pain indicates inflammation in a non-essential member, or in a member which has lost sensation, but has become greatly distended by foreign matter. Incisive pain shows that the diseased material is sharp, acid or acrid.

4. *Significance in regard to inflammations.*

(*a*) As to essence: erysipelatous inflammation denotes bilious humour; "scirrhus" (induration) denotes atrabilious humour.

(*b*) As to position: whether on the right side or the left (liver, or spleen).

(*c*) As to shape: a moon-shaped swelling in the right hypochondrium points to the liver; an elongated swelling refers one to the overlying muscles (rectus and adnexa).

5. *Significance of site and relations.*

The site may be self-evident. The relations vary in significance according to the morbific agent. Thus a lesion in the fingers may result from injury to the brachial plexus in the neck.

6. *Significance of special symptoms*: e.g. of wasting, of black tongue, burning fever.

Joannitius gives a rather different classification of symptoms and signs, though summarizing from the same text. It may be said that every classification is a matter of personal convenience. There is not necessarily any principle involved, for the subject comprises so great a variety that a strictly logical classification serves no special purpose. In some cases symptoms are characteristic of a cause, in others of an error of function, in others of a special disease. To adhere consistently to one rule of classification necessarily entails the relegation of some symptoms which are important in actual practice to a subsidiary or insignificant position in the list.

Hence it may be said that Avicenna's classification will hold good as well as any. The student obtains his knowledge from his own experience, and not from memorizing a given list.

§ 202. The following list of simple ailments, or evidences of disease, may be offered at this point.[85]

Pain.—The first evidence of disease or ill-health. Its *localization* is very significant, and charts depicting its possible sites and their meaning are of great use. Thus, headache is very commonly simply a sign of indigestion (gastric or intestinal) or constipation. The *type* of pain is most important. Thus pain in the abdomen, relieved by pressure, suggests gaseous distension due to abnormal fermentation of food, whereas pain increased by pressure suggests inflammation.

Abnormal discharges.—Abnormal in *quantity* (increased or diminished), such as diarrhœa, polyuria; abnormal in *quality*, such as nose-bleeding, hæmoptysis, expectoration, nasal discharge, salivation; abnormal in *manner*, such as incontinence.

Abnormal acts.—Vomiting, Coughing, Hiccough, Eructations, Yawning, Sighing, Shivering, Sleepiness, Insomnia, Altered gait, Altered posture (from palsy, exhaustion, collapse), Tremors, Twitchings, Convulsions, etc.

Abnormal subjective sensations.—In special senses: floating specks before the eyes in dyspepsia; ringing in the ears in cases of nervous debility, or after certain drugs, or from wax; bitter taste in dyspepsia; dizziness arising from nerve derangement, or circulatory errors. In general: nausea, palpitation, throbbing, laboured breathing; altered appetite, thirst; sense of lassitude or asthenia; irritability; loss of memory.

Outward signs.—Discoloured or "heavy" eyes. Offensive breath in indigestion and constipation. Wasting or obesity. Hot and dry skin in fevers, or states of mental excitement, or from excess of salt in the diet. Cold sweating from exhaustion, etc. Altered colour of skin. Œdema of skin. Skin-eruptions.—Signs derived from examination of the mouth: Pale tongue and gums from blood-deficiency; bleeding gums from excess of salt in diet and other causes; coloured line on gums in metallic poisonings; coated tongue in digestive disturbances; loosened teeth from errors of diet, or the use of adulterated foods, etc.

2. The Distinction between the Disease in itself and its Secondary Effects

459. Diseases may affect a member primarily, or only secondarily. Thus, a disease of the stomach may become associated with one in the head. Hence it is necessary to distinguish between the two conditions, as being respectively primary and secondary. To do this, note which arises first, and then note which of the two morbid conditions persists. The former is judged to be primary; the one which develops later is considered to be secondary. Conversely, the disease is secondary which comes after the first, and ceases when the first is relieved.

460. Errors may arise, however, because a primary disease may escape the senses (being painless) at first, and its effect may not become manifest till after the secondary disease has appeared. Moreover the primary disease may not be able to be perceived until after the secondary one has developed, and so one is liable to regard the secondary one as primary, and overlook the real root of the disease.

461. To guard against this mistake, the physician must know the anatomical inter-relations of the organs, and also the several affections which each member may show. Some of these are evident to our senses, others are not. He must also avoid giving a definite diagnosis of the root of the disease until he has had time to consider the possibility of some of the states being secondary or not.

462. Therefore the physician will diligently question the patient in order to discover signs indicative of the various affections which can possibly occur secondarily in the neighbouring or related organs. If these are not painful (tender), the patient is unaware of them, and the various signs and symptoms may be only distantly related in his mind. He cannot know the relation between remote symptoms and the real root of the disease. The wisdom of the physician alone can determine this.

463. It is easier if one recalls the various points to memory under the heading of hindrances to function. If these are prior in time, the malady is secondary.

464. Some affections of organs are usually secondary to others. Thus an affection of the head is usually secondary to one or other of the morbid states of the stomach. The converse is only very rarely true.

All the signs of the primary and secondary temperaments will be set forth in a general way now, leaving the signs of each special organ to its appropriate place. The visible signs of a composite disease are detected by the senses, but the internal symptoms of the body as a whole cannot be described in a general way except with difficulty—with the exception of the signs of plethora, of obstructions in passages, of inflammatory masses, and of loss of continuity. It is best to describe all these together when we describe them under their specific organs.

3. The Diagnostic Signs of the Temperaments.

465. Signs from which the variety of the temperament is discernible.—These can be arranged under ten groups.

I. THE FEEL OF THE PATIENT

By means of the touch one notes whether the feel of the patient corresponds to health in temperate climes and temperate atmosphere. If it corresponds, the temperament is equable. If the physician is himself healthy in temperament and finds the patient cold or hot, softer or harder or rougher than normal, and this is not to be explained by the state of the atmosphere or of a previous cold water bath, or some other contingency rendering the body soft or rough, though normal—he then knows the finding is due to an intemperament.

466. The state of the finger-nails should be noticed. Softness or dryness of the nails, not due to an extraneous agent, informs one of the state of the temperament. These qualities are not in themselves a sufficient criterion. There must be signs of balance between heat and cold. For (*a*) heat, by its resolving effect, would modify hardness and roughness of feel, and make the patient seem to be attempered and his nature seem soft and moist. Or, (*b*) cold—i.e. the opposite—by reason of the great congelation and inspissation it induces, would make the softness of feel in an attempered person seem hard, and give the impression that his nature was dry. For instance, take snow and the sun. Snow congeals and causes coagulation ; the sun causes aggregation of particles. Many persons with a cold temperament are soft to the feel, and also spare in habit owing to the presence of much crudity in them.

II. THE STATE OF THE MUSCLES, FLESH AND FAT

467. Plentiful muscular development denotes moist temperament, and warm temperament if the muscles are firm. Scanty muscular development with very little fat shows that the temperament is dry. Oiliness and fat always denote cold temperament, and the muscles are then also flabby.

If at the same time there is constriction of the veins and lack of blood, and if there is weakness from lack of food (because there is too little blood to enable it to furnish the requirements of the tissues), this shows that this temperament is inborn and habitual. But if these other signs are absent, it shows the temperament to be an acquired one.

468. Lessening of the amount of oil and fat in the subcutaneous tissues always indicates a hot temperament, because the substance of oil and fat is the oiliness of the blood, and that is derived from cold. Hence these things are less plentiful in the liver-region, and more plentiful over the intestines. There is not more oil and fat over the heart than over the liver, except as to matter ; it is not temperament or "form" which accounts for this ; it is simply that the "nature" of the heart depends for its maintenance on the presence of such-like "matter."

Congelation of oil and fat over the body is greater or less according as the heat is more or less in degree.

If the body is fleshy, and the amount of fat and oil not great, the temperament is hot and moist.

If the body is very muscular, and there is much oil, but little fat, this denotes excessively humid temperament. If extremely fleshy, this denotes superfluity of moisture and cold. It is evidence that the body has become cold and moist.

469. The more spare the body is in habit, the more likely is it to be cold and dry ; or (less likely) hot and dry ; or, dry, for such a body is attempered as to heat and cold. Or, hot, because such a body is attempered as to moisture and dryness.

III. THE HAIR

The points to note are : rate of growth ; amount ; fineness or coarseness of texture, straightness or curliness, colour.

470. *Rate of growth.* Slow growth, or absence of growth, without evidence of lack of blood—denotes extremely humid temperament. More rapid growth denotes a less humid temperament, rather tending to dryness. (Heat and coldness of temperament are shown by other signs —given above—than the hair.)

If the temperament is both hot and dry the hair grows much more rapidly, and the individual hairs are numerous and coarse. Abundance of hair means heat, coarseness much fumosity. Hence the hair is more plentiful in youthful persons than at puberty, as the humours of the latter are vaporose, not fumose.

The opposite characters denote the respective contraries.

471. *Form of the hair.* Curly hair : denotes hot and dry temperament. It may be that there is tortuosity of the minute channels and pores : and this cannot change even if the temperament changes. But the two primary causes would change if the temperament changed. *Straight hair* denotes cold and moist temperament.

472. *Colour of the hair.*

Colour	Corresponding temperament.	Remarks.
Black.	Hot.	In such cases oxidative processes are in excess of the mean (Joannitius).
Brown.	Cold.	
Tawny and red.	Equable.	There is an excess of "unburnt heat," so that the hairs always grow red (J). Hence the proneness to anger (a form of "heat").
Very fair.	Cold and very moist.	Note how plants lose their dark or green colour when dried, and become grey or white. In man, this change is produced towards the close of desiccant diseases.
Grey.	Cold and very dry.	

473. *Cause of grey hair.* Aristotle stated that hair turns grey because it takes on the colour of serous humour. (Joannitius ascribed it to decomposition changes in the serous humour occurring in old age ; greyness, he says, means excess of atrabilious humour.) Galen ascribed it to a mustiness accompanying the nutriment supplied to the hair, which retards its movement and penetration into the pores (of the hair) (i.e. hair-sac).

As a matter of fact there is little difference between the two views, because the whiteness of the serous humour is physically due to the same cause as the whiteness of the mustiness. The subject really belongs to physics.

474. Observation also shows that atmosphere and geographical situation affects the hair. One would not expect to find the hair red (which denotes equable temperament) in a black person even though his temperament were equable ; nor would one expect to find black hair (which denotes hot temperament) in a Slav, even though his temperament were hot.

475. *Relation of character of the hair to the age.* In puberty the hair is as in northern countries ; in youth, as in southerly countries ; after the age of fifty it is between the two. Abundance of the hair at puberty reveals the future temperament. As the person grows, it precedes the formation of atrabilious humour, and in the elderly person it shows that atrabilious humour is actually present.

IV. THE COLOUR OF THE BODY

476. Colour.	Temperament.	Accompanying features.
Pallor.	Cold.	Lack of blood.
Yellowish.	Hot.	Lack of blood ; increase of bilious humour.
Ruddiness.	Hot.	Abundance of blood ; sanguine or bilious temperament.
Sub-ruddiness.	Hot.	Dominance of bilious humour. Occasionally it denotes lack of blood, provided there is no bilious humour present in the blood, as is the case in convalescents.
Dark Brown.	Extremely cold.	This is because sanguineous humour is dominant, and there is deficient coagulability of the blood and it darkens and alters the colour of the skin at the same time [Joannitius ascribed blackness to the atrabilious humour].
Brown.	Hot.	
Colour of Egg-plant fruit*	Cold and dry.	The heat is such as follows upon pure atrabilious humour.
Chalky.	Cold.	Serous humour in excess (J. ascribes whiteness to the serous humour).
Leaden.	Cold and moist.	Atrabilious humour is only slightly in excess. This is because there is a trace of green in the whiteness ; the latter depends on the serous humour and moistness of temperament. The greenness depends on congelative change in the blood, for this tends to a blackness which, mingled with serous humour, produces a greenish tint.
Grey and white.	Cold.	
Ivory White.	Cold.	Serous humour in excess, and the choleric humour scanty.

477. *Colour of the eyes.*

It is not easy, but it is possible, to assess the temperament of the brain from the colour of the eyes.

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* Egg-plant ; brinjall ; solanum melongena, or black brinjall. The colour is a purple-black. The fruit is referred to as a colour in Night 357 : "a flabby nose like a brinjall" (Burton). "The vegetable is held to be exceedingly heating, and thereby to breed melancholia and madness" (ib.).

The following details are from Joannitius:

Black: due to: smallness of crystalline lens; setting of the crystalline lens too far back; abundance of aqueous humour; turbidity thereof; uvea redundant; peculiarity of the visible "breath" (scanty, or confused).

Brown: due to the contraries of the above—crystalline lens large or further forward; paucity of albugineous humour; clearness of this; deficient quality of uvea; the visible breath plentiful or clear.

Intermediate colours (black and brown mixed). The visible breath varies in amount and clarity.

Grey: visible breath less plentiful.

478. *Changes of Colour*

Change to yellow (yellowish-white): suspect disorder of the liver.

Change to yellowish-black: suspect disorder of the spleen.

Change to yellowish-green: suspect piles (this does not always hold good (marginal reading). These suggestions only apply for the moment when the change of colour takes place.

479. *Colour of the Tongue*

It is not easy to assess the temperament of the stomach and intestines and veins from the colour of the tongue, any more than it is to assess the temperament of the brain from the colour of the eyes.

There may be two different colours simultaneously in two members, in consequence of a disease. Thus, the tongue may become white and the countenance dusky. This occurs in jaundice, when this is due to an intense acridity of the bilious humour.

480. *Extraneous causes of Colour Change*

Cold climate (e.g. in Scotchmen), hot climate (e.g. negroes).

Emotional changes: fear, rage, sadness, etc.

V. THE FORM OF THE MEMBERS

481. Hot temperament: big broad chest; large limbs; no narrowing or shortening of the hands or feet; conspicuous full veins; big strong pulse; the muscles round the joints large (for growth and the form of composite structures requires heat).

Cold temperament: the contraries of all the above. The natural faculties and the formative faculty are impaired by cold, so that the natural functions are not perfectly carried out.

Dry temperament: roughness, curvature of form; joints conspicuous. Adam's apple prominent. Nasal cartilages conspicuous; nose of medium size.

Moist temperament: the contraries.

Joannitius adds: fleshiness (excess of heat and moisture in the temperament); Fatness (excess of moisture and intense coldness); Leanness (hot temperament, and intense dryness); Delicate build—cold and very dry; Massive build—cold and very moist, or very cold and very moist; Justness of form—well-balanced humours.

VI. RAPIDITY WITH WHICH MEMBERS RESPOND TO HEAT AND COLD

482. If a member becomes "hot" rapidly and easily, it shows that it is hot in temperament, because change in the direction of its own temperament is more readily undergone than in the opposite direction. Similarly, if the member behaves in the contrary way, it will be of cold temperament.

483. Some assert that it is otherwise, because we know (they say) that a thing only reacts to its contrary and not to its like. But if that were the case, it would follow that a thing would react more strongly to its like. But the reply to this is that two things are only really alike when one does not interact with the other; we then know that their respective qualities are of like "species" and "nature." Of two things A and B, if B is less hot than A, we cannot speak of it as being "like A." As long as one of the two is hotter, they cannot be called "alike." One is cold compared with the other. So an interaction (on the part of the body) is possible. B would be cold compared with A—not hot. B, too, may react with something else which is colder than itself [say C] besides reacting with "cold" [say D]. C or D may enhance the intrinsic quality of B, according as they are stronger than B or not. It is easier for it to change towards that which enhances this quality of B, or neutralizes the opposite quality of B, on condition that the new causative agent harmonizes with A and B, and neutralizes the temperamental nature (*p*).

Therefore it is clear that when the nature is of hot temperament heat will not show any action on it until the influence of the contrary cold has first been removed; and this is achieved by preventing the calefaction (which tends to be produced by a hot temperament) from becoming greater. The result is that if both events occur simultaneously, and the inhibiting agent is destroyed, they will mutually help one another in producing heat, and the two qualities will thus reach an acme.

When the body is exposed to foreign heat, however, the balance of temperament is likely to be destroyed. The innate heat of the body is all-important for resisting this. We depend on our innate heat for the neutralization of " hot " poisons, and for their expulsion and for the dissolution of their substance.

484. The innate heat, therefore, is the instrument of (human) " nature " for combating the injurious action of extraneous or foreign heat. By its means, the breath gets rid of it, expels it, disperses it, and oxidizes its material basis (*m*). Further, it combats the injurious action of foreign " cold," expelling it " by contrary." Coldness has not this power. It is only the contrary to coldness—i.e. foreign heat—which can combat or repress it. Coldness cannot combat extraneous " cold." The innate heat does.

485. Innate heat is that which protects the natural humours from being overruled by foreign calorific agents. *If the innate heat is strong*, the natural faculties are able to work through it, upon the humours, and so effect digestion and maturation, and so maintain them within the confines of the healthy state. The humours move according to its ministration. Extraneous or foreign " heat " cannot interfere with this movement, and so they do not undergo putrefactive decomposition. *If the innate heat is feeble*, the natural faculties are harassed in the regulation of the humours. For the instrument—the intermediary between the natural faculties and the humours—is enfeebled. Stagnation sets in and foreign heat now finds the humours no longer opposed to its action. It overcomes them. It utilizes them in its own way, and imparts a foreign movement to them ; and the result is what is known as " putrefaction."

486. Hence it is clear that the innate heat is the instrument of all the faculties, whereas coldness can only help them secondarily. That is why one speaks of " innate heat," but not of " innate cold " ; and why that which is proportionate to heat is not comparable with cold.

§ 203. This passage is evidently an attempt to explain the nature of bacterial action and infection without the knowledge of the actual bacteria themselves. The description is so ingenious that it requires little change to modernize it.

The following may be amplified accordingly :

1. The meaning of innate heat.
2. The nature of " foreign heat, " foreign cold."
3. The meaning of the term " hot poisons."
4. The meaning of hot and cold, as relative terms.

(1) *Innate heat.* This term, particularly in this passage, is equivalent to " vitality.' This word describes a complex concept. Though regarded as vague and quite unsatisfactory to-day, it may be said to be amenable to reduction to a formula—and a formula into which several factors enter. The condemnation of the term is due to the non-recognition of this fact and non-recognition that many well-known and freely-accepted data belong to it.

(2) *The nature of " foreign heat " ; " foreign cold."* These refer to material agents, now known as pathogenic micro-organisms. The material substance, which is stated by Avicenna to be oxidised by " innate heat," is the bacterial sub-

stance, which as we know undergoes lysis in the course of the immunising processes of the body. The "heat" refers to what we know as the bacterial toxins which act upon the thermogenic centres, and produce numerous other effects on the tissues. The word "heat" thus comprises two things. The pyrexia produced by bacterial invasion may be theoretically distinguished from the innate heat, but practically speaking the rise of temperature is generally admitted to be part of the so-called defensive mechanism against infections. The destruction of the bacteria, and of their products by anti-substances—these events are comprised in the words "dispersing the foreign heat." After all, both bacteria and products *are* "dispersed." We are only being told the same fact in different language.

In the case of foreign cold, here the organisms and products differ. But if the temperature becomes subnormal, the immunizing process is not ascribed to the lowered temperature. Recovery from the infection still depends on the "innate heat" or "vitality"—that is, a series of processes of immunization which take place whether the patient develops fever or not.

Avicenna considers that the formation of septic products is more likely if there is not much pyrexia, on the ground that in such a case the bacteria, as we should say, meet with less resistance, and are enabled to produce those decompositions of the body fluids which we know to take place readily as soon as the vitality of a part is lowered.

(3) *The meaning of the term "hot poisons."* Clearly the word poison must be understood as covering both bacterial agents and their products. The toxic products may produce rise of temperature, and are therefore reasonably called "hot"; others do not have this effect.

(4) *The meaning of hot and cold, as relative terms.* In this passage a thing is hot or cold according to its effect on the bodily sensations, or its effect on the heat centres of the body. Taken in its literal or surface meaning, of hot temperature, cold temperature, the passage is of course pedantic and useless. It should be evident that the words "hot" and "cold" cannot possibly have meant literal heat and cold.

VII. SIGNS DERIVED FROM SLEEP AND WAKEFULNESS

The sensitive faculties make use of these things frequently, in a manner corresponding to the primary qualities. Thus we say that in the wakeful state the body is the instrument of the soul.

487. If there is equipoise between sleep and wakefulness, it means that the temperament (especially of the brain) is equable. If sleep dominates, it denotes a cold and moist temperament (of the brain), whereas if wakefulness dominates, it shows a dry and hot temperament (especially in the brain).

A strong inclination to sleep denotes debility—a loss of tone of the muscular power. Histologically, sleep depends on a break in the ideation-zone of the cerebral cortex; if there is a break in the layer below that, the sleep will be that of stupor or coma. The break in this situation is marked in amentia and dementia.—Wakefulness, or insomnia, denotes: poisons circulating in the blood, powerful sensory impulses (pain), or powerful emotions.

VIII. SIGNS DERIVED FROM THE STATE OF THE FUNCTIONS*

488. *Equable temperament*: the activities of the body proceed fully and perfectly and naturally.

Hot temperament: there is over-activity, exaggerated activity. Rapid growth of stature ; increased rate of growth of hair ; early eruption of the teeth.

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* Functions may be weakened, exalted, depraved, obstructed in their action or abolished.

Cold temperament : the activities lessen and become sluggish and delayed, but a hot temperament may cause weak and sluggish activity though only if a deviation from the natural course is associated with weakness.

489. Many natural functions may slow down or lessen owing to heat. Thus in the case of sleep, sometimes there is insomnia or lack of sleep from the effect of the heat of a hot temperament. Similarly some of the natural states may be intensified by cold. Thus, again, in the case of sleep, though this is not strictly the outcome of natural functions, but only an effect conditional upon some causal agent. For the necessity for sleep for life and health is not absolute ; (*a*) it enables the breath to separate off from its impeding factors—the fatigue-substances; (*b*) there is need for a recumbent posture after a meal ; (*c*) one cannot achieve two (contrary) things at the same time. Hence the need for sleep is simply some impotency. It is not included in " natural necessity." And if its exclusion be " natural " in the sense that it is inevitable, this is only because the word " natural " is here used for " the inevitable." One word is being made stand for two things. But the most accurate application of the term is to " equable temperament," for it is this upon which equability of functions and their final completion depends. To use the term in regard to the four qualities—heat, coldness, dryness, moisture—is only hypothetical (takhmīnī).

490. Among the " strong " (" jelal ") actions which denote a hot temperament are : powerful voice ; harsh or coarse voice ; rapid way of talking ; constantly talking ; anger ; rapid gestures ; blinking of the eyelids. Before deducing a hot temperament from these, one must make sure there is no local cause for them, and that they are not confined to one particular member.

IX. SIGNS DERIVED FROM THE EXPULSIVE FACULTY AND FROM THE QUALITY OF DISCHARGES

491. The temperament is hot : (1) if the waste matters are retained ; (2) if the fæces, urine, sweat, etc., are strong in odour, acrid, of normal colour, and show the normal degree of oxidation and maceration—in the case of matters which normally undergo such changes.

If the signs are contrary, the temperament is cold.

X. SIGNS DERIVED FROM THE STATES OF THE MIND, DURING ACTION AND PASSION

"Every expression is the sign of a state of mind; that state is as the hand, and the expression is the instrument."—(Mesnavi,[58] p. 29).

492. Evidence.			Name of Temperament corresponding.	
			Hot.	Dry.
Emotional aspect	Concupiscible	1	— (Shameless)*	Infatuation; love-passion.
		2	Excitable	
		3	Lively Vivacious	
	Irascible	1	Hopefulness	Brooding
		2	Courage; temerity‡	
		3	Easily provoked to anger	Anger lasts some time
	Duration		Short	Long*
Mental capacity	Intellectual power		Good	Imaginative
	Power of observation		Good	—
	Capability		Good	—
	Talent		Conspicuous	Memory good
Moral aspects			Stern Virility of morals and manners Diligence Much flexibility of opinion‡	Gentle
Ego faculty			Love of good opinion Not easily perturbed or downcast	Takes things to heart
Movements and gestures			Rapid	
Dreams			Of warming oneself at a fire; sitting in the hot sun†	

Cold temperaments show the opposites to those given for hot temperaments; moist, the opposites to those given for dry.

The whole of the above, or at any rate the major part of it, refers to the congenital or innate temperament. Now we refer to acquired temperaments ("intemperaments").

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* In the case of the moist temperament, the duration of emotional disturbance is short.

† In the case of a cold temperament, the dreams are of being in the cold, out in the snow, or of being immersed in cold water.

In short, the character of the visual images in the dream is related to the character of the dominant humour, partly because the dream varies with the state of the "breath" at the time.

‡ These represent negative or weak aspects.

493. EVIDENCES OF THE FOUR PRIMARY INTEMPERAMENTS

Evidence.	Hot.	Cold.	Moist.*	Dry.
Morbid states to which there is a tendency	Inflammatory conditions becoming febrile.	Fevers related to the serous humour. Rheumatism.	—	—
	Loss of vigour.	—	Lassitude.	—
Functional Power	Deficient energy.	Deficient digestive power.	Difficult digestion.	—
Subjective sensations.	Bitter taste in mouth.	—	Mucoid salivation.	—
	Excessive thirst.	Lack of desire for fluids.	—	—
	Sense of burning at cardiac orifice.	—	Sleepiness.	Insomnia. Wakefulness
Physical signs.	Pulse extremely quick and frequent; approaching the (weak) type met with in lassitude.	Flaccid joints.	Diarrhœa Swollen eyelids	Rough skin. Spare habit (acquired not inborn).
Foods and medicines.	Calefacients are all harmful.	Infrigidants are all harmful.	Moist articles of diet are harmful.	Dry regimen harmful.
	Infrigidants benefit.	Calefacients benefit.		Humectants benefit.†
Relation to weather (i.e., season).	Worse in summer.	Worse in winter.		Bad in autumn

4. THE EVIDENCES OF EQUABLE TEMPERAMENT

(i.e., the evidences of symmetry, beauty of form, and good conformation.)

494. In addition to the signs of normal temperament already given, there are :

1. To the feel, the body imparts sensations mean between hotness, coldness, dryness, moisture, softness, hardness.

The skin feels moist and warm, and has a beautiful smooth and elastic surface. The complexion is clear.

2. In colour, the body shows a balance between whiteness and redness.

3. In build, the body is neither bulky nor spare, though on the whole inclined to be bulky. (Robust Habit of Body.[7]) Tallness and straightness of stature ; quick growth.

4. The veins of the skin are neither prominent nor submerged ; they are separated and spread.

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* The signs of moist intemperament include those of the cold.

† Hot water, rarefied oils are beneficial to the dry temperament and are avidly taken up.

5. The hair is neither profuse nor sparse, thick nor thin, curly nor straight, black nor white. During puberty they tend to a tawny shade rather than black, in youth they tend to blackness. [Full hair where hair should be.]

6. Equally inclined for sleep and for wakefulness.

Sleep quiet, uninterrupted, and followed, on waking, by cheerfulness, and a contented mind.

7. Agreeable dreams arousing hopefulness, with fragrant perfumes and alluring voices, visions and agreeable companionship.

8. Mental faculties : vigour of imagination, intellectual power, and memory. Emotions balanced between excess and deficiency—e.g., between courage and timidity, between anger and patience, between sternness and clemency, between vacillation and perseverance.

9. Perfection in all functions (**185**).

Therefore no conscious feeling of digestion, or discomfort of any kind. Micturition painless, the urine not feeling hot, having an odour neither sweet nor sour, amber-coloured, and forming no deposit. Defecation without soiling the skin, the fæces firm, but not hard.—The appetite according to genuine hunger, and for natural foods ; thirst only for water.—Mouth closed when breathing. Adaptability to climate and to season (Ch. M.[7]).

10. Movements of the limbs deft. (Skilful.)

495. A person with such a temperament will have a happy expression, will be lovable and contented, moderate in desire for food and drink, possessing a good gastric digestion, good hepatic and venous digestion, and good alterative and assimilative power all through the tissues. The waste matters will be moderate in amount and will be discharged through the proper channels.

5. The Indications afforded by Congenital Mal-conformation of the Body.

(i.e., asymmetry, misproportion, unshapeliness, ugliness, and the like.)

496. In brief, there is non-uniformity of temperament among the members ; or, perchance, the principal members depart from equability and come to be of contrary temperament, one deviating towards one, another to its contrary. If the components of the body are out of proportion, it is unfortunate both for talent and reasoning power. Thus, (1) a tall person with a large abdomen and short face and round head, and short fingers ; (2) a person of small stature, with small head, much flesh in the face and forehead, and even in the neck and feet—the face like the full-moon ; the jaws rounded and massive.

Similarly, (3) if the head and forehead were round, but the face very round (long, marginal reading), and the neck very thick, and if the eyes are sluggish in movement. Such persons would be the very last of people to be classed as in good health.

6. The Signs of Plethora

497. Regarding plethora there are two aspects. There is the plethora in regard to the cavities, tubes, and juice canals ; and there is the plethora in regard to power or strength (vitality).

1. *Plethora of the channels of the body* consists of an undue amount of humours or of breath. These may be healthy in quality, and merely superabundant in quantity, so that the channels are overdistended and overfilled. In such a case movements become dangerous, the vascular channels running a risk of rupture, followed by a flux towards the regions where there is back-pressure, and choking of these parts may occur, with subsequent apoplexy or epilepsy. To relieve such, the local plethora must be rapidly relieved by venesection.

2. *Plethora of strength of faculties.* In this case the error is not in quantity of humours, but in unhealthiness of quality, whereby the faculties are embarrassed, and they become inefficient for the processes of digestion and maturation. A person who is in this state is in danger of putrefactive disorders.

498. Speaking in general *the signs of plethora* of the first type are :

Objective : red face ; full veins ; tightness of skin ; sluggish movements (gestures) ; full pulse. High-coloured urine ; dense urine ; scanty appetite.

Subjective : sense of weight in the limbs ; weak vision ; dreams in which there is a sense of weight—as when one dreams one is unable to move, or is carrying a heavy weight, or cannot give utterance to words. This kind of dream may be compared with that associated with attenuation of humours, or where the humours are moderate in amount for here one dreams one is flying through the air, or moving at a great speed.

The modern term "*hypertension*" is covered by the old term of plethora or repletion. The correspondence is verified by some of its symptoms. Thus, hæmorrhagic phenomena occur—in the nose, retina, cerebrum, meninges, labyrinth, the skin ; and as hæmaturia and hæmetemesis simulating organic disease. Hypertension causes fatigue of the heart shown by : dyspnœa, palpitation, quick pulse, anginal attacks, nocturnal pseudo-asthma, bruit de galop[141] (p. 348).

499. *The signs of plethora in respect of faculties :* Heaviness; sluggishness; loss of appetite (these are also present in the preceding type). Disinclination for exertion. Sense of burdensomeness.

If the plethora of the faculty is unaccompanied by plethora of humours, the veins are not as distended, and the skin is not as tense, or the pulse as full and large, or the urine as gross (dense) or as red in colour. There is no lassitude except after undue movement and exercise and activity. The dreams consist of sensations of itching, stinging, burning, and of fetid odours.

Which of the humours it is which is dominant in such cases is discerned by the signs which now follow. But in the case of plethora of faculty, illness ensues before all its signs are manifest.

7. The Evidences which show which of the Humours is Dominant

500.

EVIDENCE.	SANGUINEOUS.	SEROUS.	CHOLERIC.	ATRABILIOUS.
ASPECT: General physique	Good.	Effeminate; bones slender, joints well-covered.	Lean; joints large.	Emaciated.
Age	+	+	+	+
Colour	Ruddy.	Unduly pale.	Yellow tinge in skin and conjunctiva.	Dusky; whole body seems dark and hairy.
Feel of the body	Flesh firm.	Soft and cool.	—	Flesh hard.
State of the skin	Reddens on rubbing; furuncles.	—	—	Skin rough; liable to dark eruptions and intractable ulcers.
Hair	:	Absent on trunk.	Hairy.	Hairy.
Surface veins	Full.	Constricted.	Thick and hard.	
Vegetative faculties:— Mouth	Liability to pustules.	Abundant sticky saliva.	Bitter taste.	
Tongue	Red.	—	Rough and dry.	—
Nostrils	—	—	Rough and dry.	—
Pulse	:	Soft, tends to be slow and infrequent.	Rapid.	
Urine	:	White.	:	Dark coloured or black; dense.
Faeces	:	:	:	:
Sensitive faculties:— Special senses: taste	Unusual sweetness in mouth, senses dull.	—	Bitter taste.	Sense of burning at mouth of stomach.
Appetite for food	—	—	Poor.	Depraved; faulty longings.
Appetite for fluid	—	Absent unless salt is taken, esp. in old people.	Thirsty.	
Muscular tone	Weariness not accounted for by exertion.	Flaccidity of limbs.	—	—
Dreams	Sees red things; blood coming out of the body; of swimming in blood, and the like.	Sees waters, rivers, snow, rain, cold, thunder.	Sees fires, yellow flags; objects not yellow appear yellow; a conflagration; hot bath; hot sun, etc.	Fear of darkness, of torture; terrifying black things
Movements (gestures)	Yawning, stretching.	:	:	:
Rational faculties.	Reaction time slow. Continual drowsiness.	— Somnolence, laziness, tiredness, lassitude.	— Hebetude.	— Sense of anxiety; wakefulness
Abnormal phenomena:— Nausea	Present.	—	Present.	—
Vomiting	—	—	Yellow and green bile and "acrid flux."	—
Gooseflesh	—	—	As from needlepricks.	—
Headache	Sense of weight in back of eyes and temples.			
Others	Blood flows out readily from nose, anus, gums.	Weak digestion and acid eructations.	Severe diarrhoea.	Splenic disorders often occur, also morphoea; evil ulcers.
Preceding factors:— Regimen Occupations Locality lived in Habits Season of year Date of last venesection Previous temperament	Note.	Note.	Note.	Note.

501. Additional remarks :

The age of the patient gives a clue to the kind of humour likely to be dominant.

Excess of sanguineous humour is shown by signs akin to those of plethora, and some of the signs given are accounted for by simple plethora.

When the atrabilious humour is in excess, the blood is dusky and heavier than normal. Atrabilious humour is seldom in excess in pale and slight persons.

One or two of the data given (under general physique ; on the hair ; the surface veins) are from Rhazes.

Note the patient at rest (in repose) and in activity (gestures, attitude).

Note that the signs of his temperament are accentuated when he is ill. The type of reaction to infection is determined by his temperament.

8. Signs of Obstruction (to the flow of the Humours)

502.

OBSTRUCTION is known to be present if there are signs indicative of accumulation of matters, and the patient experiences the sensation of fullness throughout the body without there being any of the signs of general plethora.

If the obstructions are in those channels through which much fluid is bound to flow, there is a feeling of weight or heaviness. Thus, in hepatic obstructions, the material from the aliments cannot enter the organ, and therefore accumulates and is retained, so as to produce a much greater "encumbrance" than an inflammatory swelling would. The difference from the latter consists in the great heaviness and the absence of fever.

Obstructions in other channels do not lead to such a sensation of heaviness, but only one of overfullness and of stretching and tenseness.

503. Obstruction in venous channels causes the skin to become tinged with yellow, since the blood does not then gain access to the surface (layers of the skin).

The subject of "obstructions" is capable of great expansion.

(i) The symptoms differ :—

(*a*) With each of the *humours*. Thus, serous humour obstruction is manifested as œdema of the glottis, œdema of the lung, nasopharyngeal hypersecretion, œdema of the kidney tissue, of the blood itself; vomiting, diarrhœa, headache (too much cerebro-spinal fluid), convulsions; delirium, coma, Cheyne-Stokes respiration, amaurosis.

(*b*) With the different *substances*. Thus in nephritis, obstruction of the channels in the skin prevents the wastes leaving the body by that route, with consequent manifestation as arthritis, anginas, otitis, etc.

(*c*) With the *atom groups*. Thus obstruction to the outlet of nitrogen (azotæmia) manifests as hypertension, vomiting, diarrhœa, sialorrhœa, stomatitis, parotitis, retinitis, anæmia of plasmatic type; arthralgia; fibrillar tremors; coma; loss of appetite for meats.

Viewing diseases in this way, the important thing is to find both site of obstruction, and substance or atom-groups concerned.

(ii) The symptoms may be monosyndromic or polysyndromic. (Vallery-Radot,[141] p. 296-299.)

(iii) Obstruction to the flow of "breath."

(iv) The "pores" which may become obstructed vary in size from that of the orifices of the body down to the smallest channels, whether visible to the naked eye or only with the microscope, or whether sub-microscopic or "ultra-microscopic." The pores vary in shape and consistence, resilience, elasticity, distensibility. Fluids may traverse them in both directions, but when there is obstruction, they may be able to pass only in one direction or not at all.

9. THE SIGNS OF GASEOUS DISTENSION

504. Gaseous distension is recognized (1) by means of pain experienced in the sentient members. This is because the gases produce a severance of continuity in the tissue-elements; (2) by the movements which take place in the sentient members; (3) by sound; (4) by touch.

1. The *pain* of stretching is a sign of gaseous distension, especially if the painful tissues are soft to the touch. The evidence will be complete if the pain afterwards ceases, for this could not occur without there being a loss of continuity. In members like bone or glandular tissues, gaseous distension is not manifested by pain, even if such distension arises in bones which have been fractured (unless the skin has been torn by the fractured ends).

2. The *movements* which point to gaseous distension are: fidgeting, tossing about (peristalsis). They are produced by the gaseous materials making their way through the organs out of the body.

3. *Noises* may be produced, e.g., gurglings, rumblings. These may be evoked by manual compression, percussing—as is done for distinguishing between dropsy (ascites) and tympanites.

4. *Touch* enables one to distinguish between distension with gas and other nodular swellings. Gaseous distension stretches the part and yields to pressure. That is not the case with fluid distension (liquid, viscous, mucoid).

505. The difference between inflation and gaseous distension is not in substance but in form. The form or shape, of the distended area is different when standing or lying down and manipulation will alter its position.

10. The Evidences of Solid Swellings

506. The presence of external tumours is easily demonstrated to the sense of sight. Deeply placed inflammatory swellings are revealed by accompanying fever, as well as by a sense of heaviness, if the affected member be devoid of sensation, or of stabbing pain as well as heaviness if the member be sentient. Interference or hindrance to function and movement of a part affords a further sign of the presence of a "tumour." A certain degree of intumescence of the overlying part is a very important sign of an inflammatory mass, if sensation has access to it.

Cold swellings are not accompanied by pain.

507. It is difficult to describe the signs of tumours in a general manner. Even if one could do so it would be at the expense of wearisome words. That is why it is simpler to defer details to the special chapters. It will suffice for the present to say that wherever heaviness and not pain are perceived, and the signs of dominance of the serous humour are present, this leaves no doubt about the swelling being of pituitous nature.

If there are signs of dominance of the atrabilious humour, and the swelling is hard to the touch, it will be an atrabilious mass, because induration is pre-eminent among the signs of this form of swelling.

508. Inflammatory swellings in muscular organs are extremely painful, and fever is intense ; the nerves are stretched early (causing the pain) and there is delirium. Such swellings interfere with the movements of contraction and expansion.

509. Swellings in any of the inward parts of the body cause the abdominal wall to become wasted. If they are inflammatory and undergo suppuration and track outwards, they cause extremely severe pain, with fever ; the tongue becomes very rough, and there is great wakefulness, and the symptoms become more and more severe—notably the sense of heaviness and weight and stiffness in the affected part. Induration and tension become evident. Sudden emaciation of the body, with hollowness of the eyes may develop. But when the process of suppuration has attained maturity, fever is high, pain lessens, the pulse softens, throbbing subsides, and itching replaces the pain. If there was much redness and induration, the redness lessens, and the induration is less noticeable. Pressure on neighbouring organs lessens, and all the causes of pain subside, along with the great sense of heaviness. When finally the abscess bursts there is a rigor (produced by the acridity of the sanious matter); fever increases again (because of the movement and discharge of the pus), and the pulse becomes "empty," unequal, weak, infrequent, small, broad, and slow. There is loss of appetite; often the extremities grow warm.

The pus may also be discharged through ordinary routes—the expectoration, the vomit, the urine, or the fæces.

510. The following signs after the bursting of an abscess are good: subsiding fever, easy breathing, return of strength, quick evacuation of pus through its proper channels.

511. Sometimes, however, in deep abscesses, pus passes from one member to another; and this transference is sometimes beneficial, sometimes detrimental. It is beneficial when it passes from a principal member to a subordinate one; as for instance, when it passes from the brain to the tissues behind the ears, and from the liver to the groins. It is detrimental if it passes from an ignoble organ to a noble one, or to a weaker or less resistant organ, as for instance when pleurisy involves the heart or lung.

512. The passage of latent or hidden inflammation and abscesses and eruptions to higher or lower regions affords (distinctive) signs. If they pass downwards, this is shown by difficult breathing and other respiratory trouble, and tightness of the chest. There is a burning sensation beginning below and passing to the upper parts. There is heaviness in the region of the clavicle; and headache. Evidence may also be obtained from the clavicle and forearm.

If it should pass upwards, and the brain become involved in inflammation, it is a bad and very grave sign. But if the inflammation passes into the loose tissues behind the ears, there is hope of recovery.

Epistaxis is a good sign in such a case, as it is in all inflammations of the internal organs.

A more careful account of all kinds of swelling will follow later, at the same time as we deal with the morbid states of the several internal organs.

11. The Evidences of Loss of Continuity

513. Loss of continuity in a visible member is readily evident to the senses. In the case of interior organs, loss of continuity is shown by

(1) *Pain*—boring, stabbing, tearing.

(2) Especially if there is *no fever.*

(3) Often there is the *flow of some humour*—such as (*a*) hæmoptysis ; (*b*) effusion into a roomy cavity of the body ; (*c*) outburst of purulent matter : in the cases where loss of continuity follows the maturation of an abscess, with bursting of the abscess. If the suppurative process has matured, the fever will subside and the pus be discharged, and the sensation of heaviness and pain will subside. Otherwise the pain would increase, and the other symptoms become more severe.

(4) In some cases, loss of continuity is revealed by *complete luxation* of the member, or partial displacement from its proper position (e.g. hernia).

(5) *Diversion of discharges* from normal to other channels, or into some cavity, which has itself been produced by the break of continuity. Ex. : traumatic rupture of the intestines, whereby the fæcal contents cease to leave the body; (false aneurysm).

(6) In some cases, the existence of loss of continuity escapes detection by these general signs. *Special signs* peculiar to each member must then be utilized ; such as : loss of sensation; inability to retain the fluids normally entering the part; rigid or fixed position resulting from displacement of the part from its proper position ; lack of rigidity ; inability to retain relation to another member from which it has become displaced.

514. *Prognosis.* As you are aware, both loss of continuity and the presence of (inflammatory swellings) are more grave when they occur in very sensitive fibromuscular members. In fact, such loss of continuity may prove fatal from syncope or spasm. The syncope is due to the violence of the pain ; the spasms are due to the irritation of the nerves in which the parts are so rich.

Next in severity comes loss of continuity near joints, because restoration can only be slow considering the undue mobility of the parts, and the fact that spaces are opened up in and round the joints, and matters readily flow into these spaces.

. . . . . .

We now proceed to expound the subjects of the Pulse and the Urine, as affording general evidence of morbid states.

Sphygmology

THE PULSE

"It is necessary to enquire diligently into the properties of the pulse, for diagnosis and for the use of drugs."—Duhalde.[20]

"Every important variety of pulse revealed by the sphygmograph was recognized, described, and named, before the Christian era. . . . We count the beats and note their force and volume to ascertain the strength of the sufferer and the effect upon him of the disease. . . . Many of the indications obtained from the pulse do not depend on a knowledge of the circulation at all."* Broadbent, "The Pulse," 1890, p. 32.

515. *Definition.* The pulse is a movement in the heart and arteries (the receptacles of the breath) which takes the form of alternate expansion and contraction, whereby the breath becomes subjected to the influence of the air inspired.

In modern language, "it is the change of shape from the flattened condition impressed on the vessel by the finger which the artery assumes under the distending force of the blood within it, which constitutes for us the pulse." (Broadbent, ib. p. 20.)

The subject of the pulse may be considered (i) generally, (ii) in regard to each of the several diseases. We defer the latter till a later period when we speak of the diseases themselves. At this stage we discuss the subject generally.

516. *Description.*—Every beat of the pulse comprises two movements and two pauses. Thus,

expansion : pause : contraction : pause.

One movement could not pass at once into another in an opposite direction. There must be a boundary or "limit of an act," as is expounded in the work on natural science.

Many doctors consider that it is impossible to perceive the *movement* of contraction. Others are able to perceive it—as "strength"—if the pulse is strong; as "degree of expansion" in a large pulse, as "great resistance" in a hard pulse, and, in a slow pulse, by the long period of time occupied by the movement.

Galen also says: "For many years I was doubtful about clearly discerning the movement of contraction by touch, and I shelved the question until such time as I should learn enough to fill the gap in my knowledge. After that, the doors of the pulse were opened to me. Whoever should study these things as I did will perceive that which I perceived [as it were, a brilliant light shining suddenly out from behind total darkness. Whoever allows these words to be true and not fabulous will benefit very greatly ; despair will not touch him or frighten him from the pursuit of his study, even though he makes no progress for many years."] Nevertheless there are conditions in which this movement cannot be perceived.

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* The following section on Sphygmology is therefore not obsolete, but of real value to the modern practitioner.

517. *Reason for feeling the pulse at the wrist.* (1) It is readily accessible ; there is little flesh over it ; (2) the patient is not distressed by exposing this part.

§ 204. This reason is important in the East where the doctor may not expose a female patient in any way. This interdiction accounts for the extraordinary erudition attained in the art of feeling the pulse, for instance in China. " The old Chinese doctors are remarkably good diagnosticians. Although the study of the patient is restricted to the examination of the two radial pulses, and noting the state of the eyes and tongue, the diagnosis is disconcertingly accurate." (Hartmann.[28])

William of Rubruk, a Franciscan friar (1253) recorded : " The Cathayans . . . are first-rate artists in every kind, and their physicians have a thorough knowledge of the virtues of herbs, and an admirable skill in diagnosis by the pulse " (quoted in Encycl. Brit., vi. 189, by Prof. Giles, who also states " the variations of the pulse have been classified and allocated with a minuteness hardly credible " (p. 228).

Eusebius Renaudot[148] (p. 209), in 1733, wrote : " They are so sure of the disease that they tell all the precedent symptoms to a nicety."

(3) The artery runs in a straight course (which is no small help towards accuracy of diagnosis : Galen).

(4) The distance from the heart is not great.

§ 205. The heart and arteries all pulsate with the same rhythm, so that any artery can be used for feeling the pulse. But most arteries are embedded in flesh and cannot be distinctly felt. The order of clearness is : wrist, soles, behind ears, along arms.

Arteries within bones cannot, of course be felt ; nor can arteries be made use of which have other bodies in front of them except in emaciated persons, where for instance the aorta or limb arteries become palpable for the first time.

518. *Technique in feeling the pulse.* (1) *The position of the hand.* If the palm be turned upwards the pulse will appear wider, less high and less long, especially in thin persons. If the hand be palm down, the pulse seems higher, longer and narrower.

§ 206. (2) If the patient be a male, use the left hand: if a female, the right.[98] This ancient Chinese idea, that the pulse of one side has a different significance to that of the other, is also met with, in a different form, in recent literature. Thus, Jones (see Bibl.) states that the pulse at the right wrist informs of the state of the constitution, or vitality, and that of the left wrist informs of the local disease, and the real and true condition of the patient. He further states that when both pulses are fully strong and regular, after an illness, the patient is nearly well.—Baraduc,[110] on the basis of biometric observations of an elaborate kind, asserts that reactions obtained with the right hand belong to changes in the physical or material vitality of the body, whereas those obtained with the left hand belong to the psychic vitality.—These statements are of interest in relation to the ancient Chinese idea.

(3) The position of the observer's hand.—This must be adapted according to the position of the patient. The middle finger must be placed exactly at the junction of carpus with lower end of radius. The other two fingers are now allowed to rest upon the artery, one on either side (*ib.*). The index finger should be nearest the heart. (Broadbent, p. 39.)

(4) *Emotional state of the patient.* The pulse should be felt at a time when the patient is not in a state of excitement or anger, or affected by exertion, or under the influence of the emotions, or in a state of satiety (which renders the pulse heavy), or of hunger; nor must it be a time when usual habits are neglected or new ones are being formed.

§ 207. (5) *The state of the observer.* The observer must be in a calm state of mind. He must be very attentive and free from the least distraction of thought. The body must be tranquil, and the posture at ease. The respirations should thus be unimpeded and regular. His own state of health should be good (Duhalde.[20]).

Comparison with a normal pulse is thus possible.

§ 208. (6) *Other instructions given in the Chinese system of Sphygmology.* The instructions for feeling the pulse include the following: first apply the fingers gently, touching the skin very lightly at the three places corresponding to the three fingers—named C (for cubitus, or lower end of radius), G for "gate," and W (for wrist), the successive fingerpulps being in contact with those three places. The character of the pulse is now noted in reference to the vital organs.

The next step is to apply the fingers a little harder, but not hard enough to feel the bone. The attention should now be directed to the state of the pulse at G. The third step consists in applying pressure till the bone can be felt, and then making tests with a view to deciding on the state of each of the five main organs.

If the wrist be long, the fingers need not be readjusted; but if short, readjustment of the fingers must be made several times, moving to juxtapositions each time.

The attention must not be allowed to wander from the search in question—the five vital organs and the six viscera. The sensation imparted to each finger is noted for the purpose. Great exactitude must be observed. The observation will evidently occupy a considerable period of time.

"Fine though these distinctions are, the sedulous physician will perceive and remember them."

A copy of one of the numerous diagrams in the work quoted is here appended, substituting a translation for the actual accompanying text.*

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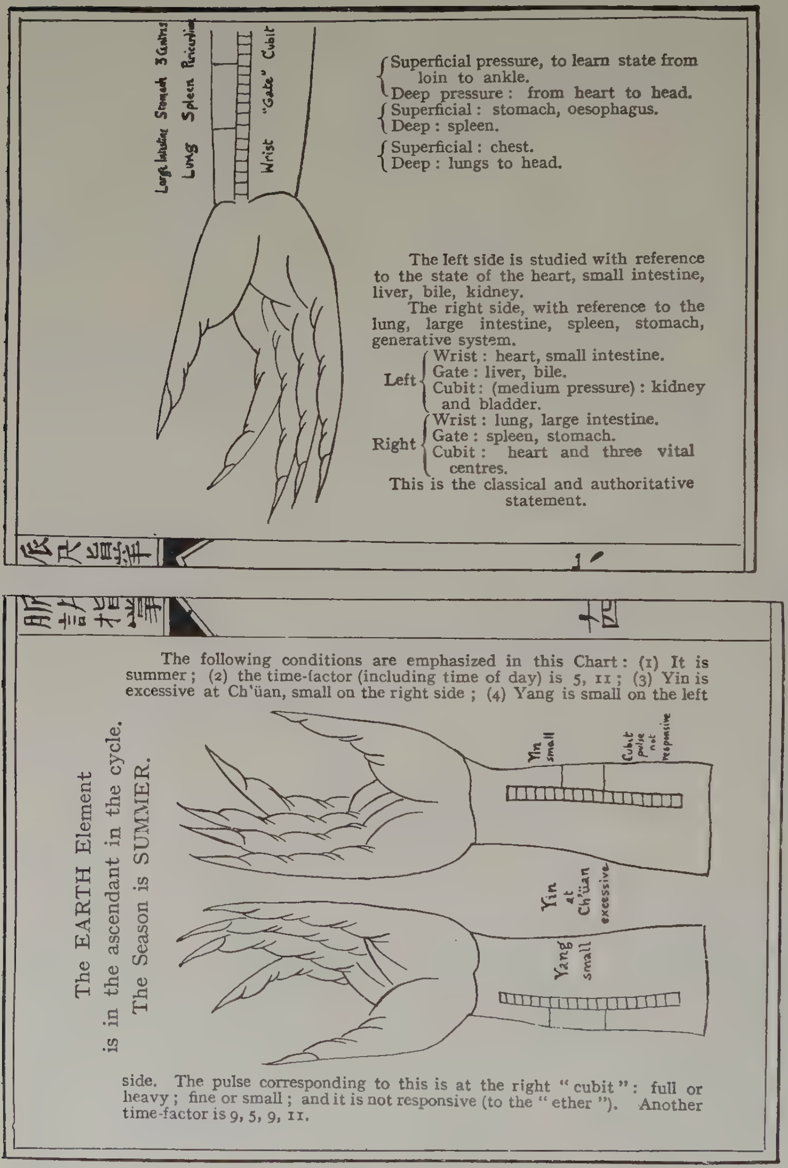
* For guidance in the translation of this passage and many parts of the work quoted, grateful thanks may be here expressed to Prof. J. P. Bruce and Mr. Li.


Large Intestine Stomach 3 Centres
Lung Spleen Pericardium
Wrist "Gate" Cubit
Yin small
Cubit pulse not responsive
Yin at Ch'üan excessive
Yang small
脈訣指掌
十四

Superficial pressure, to learn state from loin to ankle.
Deep pressure: from heart to head.

Superficial: stomach, oesophagus.
Deep: spleen.

Superficial: chest.
Deep: lungs to head.

The left side is studied with reference to the state of the heart, small intestine, liver, bile, kidney.

The right side, with reference to the lung, large intestine, spleen, stomach, generative system.

Left:
- Wrist: heart, small intestine.
- Gate: liver, bile.
- Cubit: (medium pressure): kidney and bladder.

Right:
- Wrist: lung, large intestine.
- Gate: spleen, stomach.
- Cubit: heart and three vital centres.

This is the classical and authoritative statement.

The following conditions are emphasized in this Chart: (1) It is summer; (2) the time-factor (including time of day) is 5, 11; (3) Yin is excessive at Ch'üan, small on the right side; (4) Yang is small on the left side. The pulse corresponding to this is at the right "cubit": full or heavy; fine or small; and it is not responsive (to the "ether"). Another time-factor is 9, 5, 9, 11.

The EARTH Element
is in the ascendant in the cycle.
The Season is SUMMER.

Facsimile of two pages in the Chinese Classic on the Pulse. With the (translated) text arranged as in the original.

§ 209. Some noteworthy theoretical considerations arising out of the Chinese work may be added as applicable to the Arabian conceptions, without attempting to outline their full system.

We must study the subtler aspects of the nature of the human being by invading the domain of " occult " science (by some considered to be forbidden), if we are to understand the real position not only of the great Chinese work, but also that of the Canon itself. With such a key, many of the passages acquire an entirely new aspect and value. The expansion and retraction of " the breath "—so important in regard to the subject of the nature of the pulse, respiration and other periodic movements—are part and parcel with diurnal and other changes in what is called the " cosmic ether." By working out the formulæ embodying the behaviour of the human vibrations, using biometric methods, Baraduc[110] makes concrete that which is usually passed over as unauthenticated and apocryphal.

The interpretation of the pulse depends on the interpretation of the body itself. The latter follows " world-conception " rather than concrete anatomy. The natural phenomena of the patient harmonize with those of nature in general, and the two must be taken conjointly.

According to the classical style—" the two ideas—' urge,' ' change '—how important they are ! " They provide the key to physiological processes, and also to the understanding of the pulse. They represent something deeper than our modern idea " forces of Nature " ; they are over and above the ordinary course of Nature, as expressed in the Latin "praeternaturalis." These two ideas provide the purpose of study as the physician sits with his hand on the pulse, and his mind stilled for no small period of time.* The relation between the root factors of life and those of the patient is to be elucidated ; and they find their expression in terms of functional activity of the several organs of the body. Hence this science of sphygmology pays regard to the seasonal variations, the age, the sex, the personal constitution, the dominant ' element,' its phase (rise or fall), and especially the character of the vital force—active, passive, negative, positive (see Figure). It aims at forming an opinion as to whether the illness is slight or deep-seated, easily curable or incurable, fatal or not, and if fatal in how long a time.

The permutations and combinations—the five *tsang* pulses, the six *fu* pulses, the seven *pyau* pulses, the eight *li* pulses and the nine *tau* pulses—all these afford ample scope towards a system which may encounter ridicule but is too rich in minutiæ to be lightly put aside.

For, quoting Broadbent again : " It is impossible to examine with attention a large number of pulses, whether among the healthy or the sick, without being struck by the extraordinary diversity of frequency, size, character, tension, and force met with. This diversity prevails quite independently of disease in both sexes and with all ages, especially in regard to diameter of vessel and tension and force of pulse. . . . Taking everything into account, there must, when we compare the small, short compressible pulse of one man with the large, firm and long pulse of another be great differences in the velocity and energy of the movement of blood through the capillaries in different individuals, and clearly there are great differences in the circulation of the same person at different times. . . . The fact that such differences are compatible with health and vigour is conclusive evidence that nutrition and functional efficiency, even of the nerve-centres, are not in such close relation with and intimate dependence upon the blood-supply as we are sometimes apt to suppose."

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* See Frontispiece.

The endless diversity in the pulse is not an incident, it is fundamental; the ancients sought to reduce it to a science because they (rightly) believed there was a law underlying this diversity. This goes with the fact that the various organs of the body actually vary greatly from the standards adopted by the pathological anatomist. The amount of blood discharged from the heart at each beat is very different in various persons. The state of health is as it were something over and above the ordinary physiological mechanisms so fully expounded in modern textbooks. The attempt to reduce nutrition to mechanical laws is an attempt to bind to mechanics that which is beyond mechanics.

Hence the study of the Chinese system, and of their world-conception affords additional justification not only for contending that corporeal form, corporeal phenomena, and mental phenomena—features, contours, build, mannerisms, talents—all belong together and are mutually illuminative, but also for proceeding to the formulation of these associations and inter-relations.

If in so doing, a Medicine is built up in which disease takes a very minor place, and " soil " (a rather tiresome, though expressive word) a first place, which it is the object of the physician to elucidate and continuously realize, It will at least be a guide to something approaching universality of application, and cease to attempt multi-specific therapy.

§ 210. The idea that different sensations can be imparted to adjoining fingers by one and the same pulse may be discussed briefly here. It must be assumed that there are potential waves of different lengths passing along the artery at the same time. Long waves reach one finger, but not another. The long sweep of an artery can actually be seen in thin subjects. The waves usually thought of are the short ones induced by the force of the impacts of the heart wall on the blood. Long waves consist of changes of tension in a spiral direction, and careful concentrative observation will allow such an accession to be felt.

§ 211. The relation between pulse and special organs is not to be regarded as fanciful, when one obvious instance alone will justify it—the influence upon cardiac activity and force of beat which the state of the stomach exerts.

§ 212. The frequency of missed beats, and the number of misses compared with number of respirations, exemplifies another very widely neglected aspect of the study.

§ 213. The names given to pulses are of interest, but it is difficult to assign Chinese terms to particular Arabic or Latin names. It will suffice to present the following comparisons of pulse-types with natural objects, and human actions.

Natural objects : Blade of small onion, solid within ; stone bullet shot out of a crossbow ; drop of water ; down ; drum-head ; grate in a passage ; hole in a flute ; filament of hair ; scattered leaves ; a pestle ; pills ; a silk thread ; the handle of a staff or spear ; untwisted string ; worn-out cloth.

TABLE OF TERMINOLOGY

A.—GENERAL TERMS.

(Arranged in pairs of opposites.)

Group No.	Section in trans.	Term used.	Term in Latin Text.	Term in Bulaq Text.	Term in Chinese Text.‡
(1)	**521**	Long–Short	Longus–Curtus	Tawīl[1]–qaṣīr[2]	ch'ang–tuan
		Broad–Slender	Latus–Strictus	'arīḍ[3]–ḍayyiq[4]	
		Deep–Elevated	Profundus–Elevatus	munkhaffaḍ[5]–mushrif[6]	ch'êng–fu
	522	Large–Small	Magnus–Parvus	'azīm[7]–saghīr[8]	ta–hsiao
		Thick–Slender	Grossus–Subtilis	ghalīz[9]–daqīq[10]	
(2)	**523**	Strong–Weak	Fortis–Debilis Vehemens*–Imbecillus Validus*–Languidus	qawi'[11]–ḍa'if[12]	li–jao hung
(3)	**524**	Swift–Slow (Rapid–Sluggish)	Velox–Tardus	sarī'[13]–baṭi'[14]	k'uai–ch'ih
(4)	**525**	Hard–Soft (Compressible–Incompressible)	Durus–Mollis Lenis*	ṣalb[15]–layyin[16]	shih–juan (Kê)
(5)	**526**	Full–Empty	Plenus–Vacuus	mumtali'[17]–khāli[18]	man–kung (hsū)
(6)	**527**	Hot–Cold	Calidus–frigidus	ḥarr[19]–bārid[20]	
(7)	**528**	Hurried-Infrequent	Frequens–Rarus	mutawātir[21]–mutafāwut[22]	chieh(?)-huan(?)
		Brisk–Sluggish	Continens–Resolutus	mutadārik[23]–mutakhalkhil[24]	
		" Dense "–" Rare "	Spissus†–Lassus	mutakāθif[25]–mutarākhi[26]§	mi (chin)–san
(8)	**529**	Equal–Unequal (Regular–Irregular)	Aequalis–Diversus	mustawi[27]–ikhtilāf[28] (mukhtāf)	jun–k'ou
(9)	**530**	Orderly–Disorderly	Ordinatus–Inordinatus	Muntazim[29]–mukhtalif[30]	
(10)	**533**	Rhythmic-Arhythmic	Pondus–arrythmus	Wazn–arda'l-wazn[31]	ting-tai

* Synonymous words occurring in older Latin editions.

§ These synonyms all appear together in the one (Bulaq) text.

† In the Latin the term " spissus " is often used as the opposite of " rarus." In the Arabic, the latter is mutafāwut, to which mutawātir is opposite. In the passages in which spissus is used, the Arabic is often mutawātir and not mutakāθif. There is actually a slight difference between frequens and spissus, for the former has the thought of an abrupt rise in the pulse-beat, according to group-number 2, whereas spissus conveys the idea of beats very close together. Rarus may be taken as the counterpart of either thought: if it means a leisurely rise, it is in accordance with group-number 3; if it means " spaced," this is also the idea in mutafāwut. The Arabic distinguishes the two ideas of rarus, by using mutarākhi for sluggishness.

The words rapid, hurried, brisk—slow, sluggish, leisurely, rare, and the words frequens, spissus, velox—rarus, tardus, languidus, are apt to be misleading, and it is difficult to avoid inconsistency, both in the Latin and the English, for in some cases one word conveys a better idea of a shade of meaning, and in others another, whichever Arabic term is employed.

Actions seen in nature: a bird pecking; a bubbling spring; the branches of a willow tree in a gentle zephyr in spring; drops of water dripping through a crack in the roof; frisking fish; feathers agitated by the wind; a bird flying low; liquid being constantly gulped down; rolling of thunder; scattered leaves; swimming on the surface of water; the pace of a toad embarrassed by weeds; water simmering in a kettle over a fire; waves running into one another.

Human actions: Throwing earth over an object; going by stealth; the strokes of a knife-point; a knife scraping bamboo; puffing and blowing in going upstairs; turning back.

§ 214. *Ayurvedic Sphygmology.*—Sarangadhara gives eight or nine verses showing how to examine the pulse, and gives the characteristics belonging to derangements of Vayu, Pitta and Kapha singly or in combinations. But this interesting subject is necessarily not dealt with here.

519. *Ten features in the pulse.* We say that there are ten features in the pulse from which we are able to discern the states of the body. Some group them under only nine headings.

(1) Amount of diastole; estimated in terms of length, breadth, and thickness.

(2) Quality of impact (lit. knocking at) imparted to the finger of the observer at each beat.

(3) Duration of time occupied in each movement.

(4) Consistence of the artery (resistance to the touch).

(5) Emptiness or fullness of the vessel between the beats (modern: compressibility).

(6) The feel—whether hot or cold.

The remaining features concern several beats:

(7) Duration of time occupied by the pauses.

(8) Equality or inequality of force in successive beats.

(9) Regularity or irregularity; orderliness or disorderliness. Presence of intermissions.

(10) Metre; rhythm; harmony; measure; accent.

§ 215. *Additional points:* frequency, or number of beats per minute; number of beats to each respiratory movement (inspiration plus expiration; mode of rise, mode of fall, and kind of pause at C.G. and W. as one tests from skin to bone and back; the number of beats which occur before there is an intermission (an intermission is almost certain to occur in everyone); the comparison of the patient's pulse with one's own, or with that of a person of definitely equable temperament; the comparison of the pulse with that which should be present at a given season.

DETAILS

520. (1) *Amount of Expansion.*—The kind of *pulse in terms of the three dimensions:* length, breadth and thickness. There are nine variations in regard to one dimension alone, and these are called "simple," and there are nine compound varieties.

§ 216. Broadbent remarks ("Pulse,"[115] p. 7 footnote) that the classification of pulses according to length, breadth and thickness is superfluous. "Deserting the path of observation, Galen did not see that a cylindrical tube would expand equally in all directions, and that there could not be any difference between its breadth and depth. . . . The permutations and combinations of large, moderate and small pulses, to the number of 27 varieties of pulse—an over-refinement on purely theoretical or transcendental grounds, which led to extreme confusion."

§ 217. A careful consideration of the text of the Canon, in conjunction with the Chinese writings, suggests that something more was in mind. One is dealing with waves, not with cylindrical tubes merely. There is a subtle distinction between breadth and thickness. Every tiny portion of an artery is fluctuating continuously both in health and disease in virtue of its vasomotor endowment; and it is this that is sought. Here, as in so many matters in regard to the living being, the simple mechanistic conception leads to error (and to scepticism about the existence of unthought-of detail). It is possible in the physiological laboratory to reduce the (experimental) animal into something very nearly a mechanism, or actually into a mechanism, and in that way secure results which triumphantly prove the contentions offered; but the living human being with the full possession of all his faculties constitutes a very different "proposition." Moreover, observations on the more subtle vibrations, as by biometric study, go to suggest that there may be reason in the ideas in question (cf. Baraduc[110]).

521. The *simple pulses* are: the long, the short and the mean; the broad, the slender and the mean; the deep, the elevated and the mean.

The long pulse is one which is longer than normal. This is the type appropriate to a person of equable temperament or else approximating to this. The difference between the natural and the equable has been already made plain.

The short pulse is contrary to the preceding.

The mean between these two extremes completes the first group of three. The remaining six can be understood on the same lines.

Short pulse: Impact sudden; acme momentary; subsidence of wave abrupt, dicrotic wave present; artery large; tension low.

Long pulse: Impact deliberate; acme persisting; subsidence of wave gradual; artery contracted.

Normal pulse: impact sudden, acme moderately high; subsidence of wave gentle; tension moderate.

522. As regards the *compound pulses*, some have received distinctive names and some have not. A pulse which is increased both in length and breadth as well as in depth is called "large." When all these dimensions show diminution, it is a "small" pulse. The moderate pulse is the mean between these two.

A small pulse may seem to be a large one in a wasted subject; hence the pulse may be palpable in arteries in which it is not usually felt. The aorta may be felt. A pulse may seem small because carelessly felt in a person with a thick wrist.

A pulse which is increased both in breadth and depth is called "thick"; one which is diminished in these two dimensions is called "slender." The medium pulse is the mean between the two.

523. (2) *Quality of impact.* The varieties are three: strong—this resists the finger during expansion; weak—the opposite character; and the intermediate.

Strong or violent pulse.—Impact strong; acme high; artery incompressible. Occurs temporarily in emotional states, or after the bath. It is habitual in persons of passionate nature (Aeg).

Weak or feeble pulse.—Impact faint; acme low; artery between beats is compressible.

524. (3) *Duration of cycle.* There are three variants: rapid or short or swift—where the movement is completed in a short space of time; slow or sluggish or long—the contrary; and the intermediate, or moderately quick pulse.

525. (4) *Consistence of artery.* There are three variants: soft or easily compressible; hard, firm or incompressible; and one of moderate compressibility.

526. (5) *Fullness or emptiness.* The full (high) pulse seems to be overfull of humour and gives the impression that it needs liberating. The empty (low) pulse is contrary in character. There is an intermediate between the two.

Empty pulse: the artery feels as if it contained bubbles of air, so that the fingers seem to fall on an empty place (Aegineta). (Chinese simile: "the hole in the flute.")

527. (6) *The feel of the pulse.* Hot, cold or intermediate.

528. (7) *Duration of pause.* Hurried ("dense"), where the period between the two successive beats is short; sluggish ("rare"), where the period is prolonged. And there is a mean. This period of time is recognized from the contraction-period, but if contraction cannot be perceived it is estimated from the period between two expansions. In this case it is reckoned from the times of the two extremes.

529. (8) *Equality or inequality.* This is reckoned according as the successive pulses are similar or dissimilar, there being a difference of size (large or small), strength (strong or weak), swiftness (rapid or slow; prompt or sluggish), hardness or softness, until it happens that the second expansion of the first pulse is overtaken by the first of the next (due to excess of innate heat), or is weaker than the next (excess of weakness).

If desired, one could expand this discourse and consider the equality or inequality in regard to the three variants in the other features of the pulse already named. But it is sufficient to consider them only in regard to strength.

Regular ("equal") pulse in the strict sense is one which is regular in all these respects; if it is regular only in one feature, it is so specified. Thus we speak of a pulse as regular ("equal") in strength or regular in speed. In the same way a pulse is irregular either in all respects or only in one.

Equal pulse: this is always regular.

Unequal pulse is not altogether irregular. Supposing it to have no equality, and yet to preserve a certain period, such, e.g., as to extent of diastole, if there are two great and one small, then again two great and one small, and so on, such a pulse is unequal but regular. If it not only had no equality, but also no order in its inequality, such a pulse would be not only unequal, but also irregular.—So, too, with the other kinds.

" Not only may an inequality in the time of motion take place in regard to one pulsation in one part of an artery, but also in regard to the strength of the power ; not so, however, in regard to the extent of dilation (for it is impossible that the same pulse in the same place should be great and small at the same time), nor in regard to the other kinds of pulses. But in different places different parts of an artery may exhibit a double inequality in one pulsation. For the motion may continue constant, and be swifter at one finger, and slower at another ; or it may intermit, and one finger may perceive it, and another not. And also, in regard to the extent of the diastole, the same inequality becomes apparent in different places."

Irregular pulse.—Sometimes there is altogether an irregularity, observing no periods whatever. Sometimes there is regularity as to periods, but, having no continued order, they may in this respect be called irregular, but in so far as they observe a certain period regularly, they are regular as to their periods. E.g., two great, two small, three great, three small, and so on. (Aegineta, after Galen.)

530. (9) *Orderliness or disorderliness.* There are two forms : the pulse may be irregularly orderly or irregularly disorderly. The orderly pulse maintains orderly succession. This occurs in one of two modes. The orderliness is absolute, where there is every feature maintained ; or cyclical, where there are two or more irregularities which keep on repeating in cycles, as if there were two cycles simultaneously, or superposed, so that the original order reappears.

In this way it becomes evident that the tenth feature belongs here, in a certain sense ; so that those who restrict the features to nine instead of ten are justified.

531. For one must now see *the musical character of the pulse.* For *in the art of music* sounds are juxtaposed in orderly relations of loudness and softness which keep on repeating at regular intervals ; rates of utterance vary—some sounds coming close to one another, and others being further apart ; the attack may be abrupt or gentle, sharp or dull. The notes may be sounded clearly or be indefinite ; they may be strong or weak ; the volume may be full or " thin." The rhythm of the sequence of the sounds may be regular or irregular.

In feeling the pulse, all these features are also to be met with. The intervals between the beats, or the successions, may be harmonious or inharmonious. So, too, the irregularities may be orderly or disorderly. It is orderly when there is a proper relation of strength and weakness. It is disorderly if there is not.

All this belongs to the question of order and regularity.

532. Galen indeed discussed the metre of the pulse, or its rhythm along the lines of musical nomenclature. Thus we would have double time, three-four time, common time, four-five time, five-six time, and so on. For those who have a sensitive touch and a keen sense of rhythm, with a training in the musical art, such minutiæ of observation could be correlated in the mind. I am surprised to think how many of such relations could be perceived by the sense of touch, and yet I am confident that it can be done if one is habituated to the use of it, and can apportion metre and beats of time. On the other hand, since these variations all belong to inequality and disorderliness it is not necessary to define them particularly.

The analogy between pulse and musical time is found in the Chinese work as well as in Avicenna. The fact that they compare certain beats with those produced on particular musical (stringed) instruments shows that they had something in mind like that suggested above. The *Kin* pulse is so named after a musical instrument of that name; another pulse is compared with the vibration of the thirteen stringed instrument named *Tseng*.

533. (10.) *Metre*. Even if the preceding details cannot be perceived, at least the relation between period of expansion and period of pause can be appreciated, as well as the relation between the total duration of beat and the total duration of pause. Under this heading, then, we place: first total period of pulse : next total period; period of expansion : period of pause; period of expansion plus period of pause : period of contraction plus period of pause; period of expansion : period of contraction. A relation of period of expansion : period of contraction; or, period of first pause : period of second pause, is not important.

534. Metre (rhythm, "beat," accent) is good (eurhythm) or bad (arhythm) according to the musical analogy. There are three kinds of arhythm: (i) pararhythm, where the beat is altered only slightly, and temporarily. Ex.: where the adult has a metre which is only natural in youth; where a child shows a rhythm proper to an adult. (ii) Heterorhythm. This is a change greater in degree. Ex.: where a youth has a metre proper to an old man. (iii) Etrhythm. Here the change is to something altogether different, as where the metre does not conform to the human type at all. A great change of metre denotes great change of bodily state.

§ 218 Relation between beats to musical time may be equally exemplified from Arabic poetry, for the richness of the poetic metres gives a simple and ample parallel. Cadences, pauses (corresponding to intermissions of beat) of various lengths produced by the words and phrases and intonations belonging to emotional expression being natural sequences with evident relations to physiological variations. A short passage of poetry may sometimes be sufficient basis for a correct impression of the whole, but it is better to hear the whole. So, in feeling the pulse, much may be learnt from the observation of the beats for a minute or two, and yet it is better to study a long series of beats in order to be sure there is no intermission at all. This thought is applied in Chinese sphygmology. (See § 229).

§ 219. *Rhythmical successions of words—musical rhythm——effects on emotional state and on physiological processes.*—The effect of words uttered in rhythm resembles that of musical successions of sounds. The different forms of rhythm which are adopted in different kinds of poetry have each their own effect on the emotional state, and tend to produce in the brain all the concomitants of the emotional state which they themselves belong to. Therefore the reciter is able to produce specific effects on the minds of his hearers. For this reason, the idea of rhythm and cadence can be pursued both in Arabian poetry and in Arabian music; and it can be pursued with respect to both aspects of æsthetics in any country or language, though some languages are more potent in their influence, according as they are intrinsically more, or less, musical.

We may note that as the rhythm, whether of words or musical notes, evokes an influence on the pulse-rate in the course of their effect on the ear itself—both internal ear and the ear of the mind—so the emotional effect will be produced even though the hearers are not purposely or specially receptive. This emotional effect may be inevitable, or it may be deliberate. To quote from numerous passages in the " Nights,"—" touched with it a masterly touch, at once exciting to sadness and changing sorrow to gladness . . . went on to sing . . . to many and various modes, till our senses were bewitched, and the very room danced with excess of delight and surprise " (163); " meseemed the doors and the walls and all that was in the house answered and sang with him " (688); " played a measure which made all hearts yearn " (37) (Burton, ii. 291; iv. 322; i. 337).

When the effect is deliberately sought, it is stronger the more thoroughly worked out the principle is—which explains why some composers meet with more response than others, and why some compositions are considered more perfect or attractive than others. Yet a great composer may still be in ignorance of why that particular music should meet the need; he may be guided by the effect which the thought of the particular music has on his own organization; or he may even work according to stereotyped lines elaborated by theoretical developments and studies, without having even " intuitive " feelings of his own. (Cf. Frederick Corder, [158], p. 7). Music, the composer, the listener—all three show the same possible aspects: the purely artistic, the emotional, the scientific or intellectual; and, more rarely, the inspirational and the celestial. The number of listeners whom he will attract depends on the type of music which the composer employs. In this way, for some the pleasure is in the stirring-up of desire to accompany the music with the bodily movements of various dances; for others the pleasure is through the feelings; for others it is through the intellect (e.g. the fugue); for others it is through some glimpse of the Abstract Truth which such music renders possible, even though they understand not what it is doing. But the last-named does not need music in the ordinary sense of the word (i.e., instrumental); it is that of which it has been said: "The music of God is everywhere for those whose hearts are open to hear it."

We may also note that it is not only the pulse-rate and the manner of the pulse beat which is influenced by the musical rhythm; the effect pervades the body[*], because all the vibrations which belong to the secretions and excretions, and to the nervous system throughout are affected, and tend to harmonize, each in their own way—the successive waves becoming set so that all reach the same phase at some same moment which recurs every so often. The movements belonging, for instance, to the emergence of secretory granules from a salivary or peptic cell, or an adrenal cell, alter in rhythm during the time the music lasts—and possibly for some time after. That these movements are essential in the vital phenomena is easily verified by studying such cells, e.g., in invertebrata, with the ultra-microscope, or even by studying saliva itself.

§ 220. *Additional remarks on Rhythm.*

Let *a* and *c* represent the heart-sounds, and *b*, *d* the pauses. The ratio *b /d* is remarkably constant, whatever the number of beats per minute. Exercise, excitement, fever, etc., increase the rate, yet do not alter this ratio.

The normal rhythm is *ab /c /d*; that is, "triple time."

Double-time is *ab /cd*; where the sound is "tick-tack," *b* is the same length as *d* (for instance, owing to shortening of *d*). Such is what occurs in palpitation or tachycardia.

If, however, *b* becomes long, it shows that the peripheral resistance is greater. If *a* is stronger, *b* is longer. If the time is still triple, it necessarily implies that the pulse-rate is slower. But if this rhythm now becomes double-time, it shows that the resistance is too great for the heart, and that the heart is dilating or dilated. This happens for instance in chronic renal disease, or acute renal dropsy associated with myocardial change.

Four-time.—1. *ab /c /d /d /*. The contraction is quick, the resistance is low. This occurs in fever or in excitement. This rhythm tends to return to triple by shortening of *c* to: *abc /d /d /*. The pulse is short.

Such a pulse may follow on a double-time pulse; for instance in chronic renal disease. The prognosis is then grave.

A similar effect is produced if the cardiac contraction is not completed either because the muscle is too weak or the resistance too high. To find such a pulse forewarns the physician of cardiac asthenia forty-eight hours beforehand.

2. *aa /b /c /d*. This is met with where the systemic and the pulmonary pressure are not equal. The former may be too high from renal disease; the latter may be too high from pulmonary or bronchial disease. Where the heart is hypertrophied, such a rhythm denotes failing heart.

The second "*a*" is not usually loud, but it may be as loud as the first "*a*." In such a case one could feel both ventricles beating separately over the apical region. *ab /c /c /d* may appear simply by holding the breath. It may also appear in mitral stenosis, in bronchitis with emphysema, in pericarditis, in pleural effusion and in cases of cerebral tumour.

Five-time: *a /b /c /c /d*; *á /b /c /c /d*; *a /b /*c^1 */c /d*; or *a /b /c /*c^1 */d*. These are all variants of "bruit de galop." The problem to solve in each patient is: which is the source of the second *c*? Is it the pulmonary valve? The causes are the same as of the preceding. Pulsus bigeminus: *áb /*c^1*d / /ab /cd / /áb /*c^1*d*, etc., in the case of the heart, but *áb /cd /ab /cd / /áb /cd /* etc., in the pulse at the same time. This type is found in mitral stenosis under treatment. Another form: *ab /cd / /ab /cd / /ab /cd / /* etc., in the case of the heart and *ab /cd /d /d / /ab /cd /d /d /* in the case of the pulse. This type is found in more advanced cases, and in cases of epileptiform attacks. It simulates alternate action by the two ventricles. Pulsus trigeminus; *ab /cd / /áb /cc /d / /ab /d /d / /*

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[*] Bearing on this is a recent paper by Swale Vincent and J. H. Thompson: "the effects of music upon the human blood pressure." (Lancet, March 9, 1929, 534.)

Some heart-beats are too weak to reach the wrist; or, in some cases too little blood enters the heart. The pulse may therefore be irregular though the heart is regular; or the pulse may be more irregular than the heart.

2. The Regular and the Irregular Pulse

535. Some say that irregularity (dissimilarity) of the pulse applies to a succession of beats or to any individual beat. But when the irregularity is in the individual beat the various components are diverse,—whether in the various places where one applies one's fingers, or only at one particular point of application.

536. When the irregularity is in regard to several pulsations there may be a regular succession of events. This begins with one pulsation and there is a change to a greater or lesser, following on regularly step by step until a maximum or minimum is reached, after which there is a break, and the original cycle is resumed. Or, the beats continue at the same level for a time, and there is then an intermission and the original cycle is resumed.

The whole cycle may show only one irregularity or it may show two or more. In this case, it is as if there were two cycles, distinct from one another, and yet keeping to one order, so that the whole seems to be just one single cycle.

The irregularity may consist in the occurrence of a pause when one expects a beat, or in the occurrence of a beat in the middle of a pause.

537. When the irregularity refers to several components of one single pulsation, this may be in regard to relative position or to movement. And as there are six components there will be corresponding irregularities: (*a*) expansion swift or sluggish; (*b*) premature or delayed expansion; (*c*) strength or weakness; (*d*) largeness or smallness. All of this may be orderly and regular or may vary by exaggeration or by deficiency—in two components or in three or in four.

This may all be worked out for oneself.

538. Irregularity of the pulse in one section* is shown as an intermitting or as a recurrent or as a continuous pulse.

The *intermitting* pulse† : one component is separated from the next only by a short interval and a pause is interposed in another, so that the two extremes of the pulsation vary in swiftness, sluggishness, and the like.

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* Juz': a section of the Quran.

† Intermitting pulse: a smaller beat occurs after one or more great pulsations: sometimes even the smaller beat is wanting. Intercurrent pulse: this is the

The *recurrent* pulse† : here a large pulse becomes small in one component and then becomes slowly large again. In this case there may be two kinds of pulse passing into one another, so that, for instance, one pulse, by its irregularity, comes to appear like two, or two pulses come to appear like one. Opinions about this differ.

"When the radial artery is completely closed by one or more fingers till the direct pulse is arrested, a feeble and retarded beat can be felt in the distal part of the vessel. This is because the blood-pressure is low, and the arteries are relaxed, and the force of the heart strong." [116] ((p. 52.)

The *continuous* pulse is one in which the expansion is continual and unbroken. There is a steady increase from slowness to swiftness, and from swiftness to slowness; from equality to inequality; from largeness to smaller, and so on. There is no break in the change, for it is continuing the whole time. Sometimes there is more irregularity in regard to some of the components and sometimes there is less.

§ 221. Brief summary:—

Variations in *rate of expansion:* Sudden; deliberate; second expansion quick; or slow; first sudden and then tardy, or vice versa.

Rate of fall or contraction of the vessel: abrupt, or gradual and gentle.

Variations of *degree of expansion:* large, small, moderate; forceful or feeble; alike in every beat or unlike.

Variations of *duration of expansion:* first short, then long, or vice versa; momentary; persisting; or mean.

Variations of *duration of pause:* first short, then long, or vice versa. Pause when there should be a beat; beat when there should be a pause.

Variations of *size of successive beats* or between the beats: first diminished and then increased; first increased, then diminished. The size of the artery between the beats informs of the constant pressure in the artery. To ascertain it, roll the artery transversely between the beats; it should not be palpable between the beats unless the skin is soft and flexible and thin. Inability to feel the pulse between the beats means low tension; if easy to feel, the tension is high.

Variations *in successive beats:* the fourth beat may be irregular in one or other respect, or the fifth or the sixth or the seventh. Every beat may be different (irregular disorderliness).

3. THE VARIETIES OF IRREGULAR PULSE WHICH HAVE RECEIVED DISTINCTIVE NAMES

539. *Gazelle Pulse*: [Syn.: goatleap pulse; modern "jerking"; "pulsus bisferiens"]. The expansion is interrupted and occupies a longer time than usual and remains at a certain height and is succeeded by a swift increase to the full height.

Just before the wave begins to subside a second heat is felt (Broadbent)—"a swifter spring than before" (Aegenita)—The two phases of the one beat are unequal.

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opposite. When we are expecting an interval of rest, a supernumerary pulsation occurs. (Aeg.)

These two pulses denote impairment of the cardiac power, the degree being greater in the intermittent than in the recurrent.

Cause: febrile heat. If the commencement of the diastole is feeble, and there is increase in velocity towards the end and beginning of the systole, this shows that putrefaction is prevailing, nature hastening on the discharge of the fuliginous superfluities. But if, on the other hand, the commencement of the systole is feeble, and the speed is towards the diastole, this means that heat is prevailing.

In fever cases, such a pulse is accompanied by density, and sometimes by largeness, if the artery is not too rigid. (Aeg.)

(This pulse is characteristic of pericarditis.)

540. *Undulatory* [" bounding " (modern) ; " like rolling waves "]. The irregularity is in respect of largeness and smallness of artery, of degree of rise, and of breadth, and in the position of the beginning of the beat (whether too soon or too late), and also in softness. It is not very small ; it has a certain breadth, recalling the movement of waves, which follow upon one another in orderly fashion and yet vary in the extent of upward rise and downward fall, and in swiftness and slowness.

Aegineta says : " The whole artery is not expanded at once, but first under the first finger, then under the second and so on ; like a series of waves. The wave may be carried on straight or obliquely ; it may be high but short, low but long, broad or narrow, unequal in speed and force."

Rhazes says : " It is one which in breadth takes up much space of the finger ; with this it is soft and full, but there is not much rise or fall ; one rise seems to join to another until it resembles waves, one following the other."

541. *Vermicular* [modern " creeping "]. This resembles the preceding, but is small, soft, feeble, and very hurried. The closeness of the beats causes it to be mistaken for a swift or rapid pulse.

The feel is that of a worm wriggling. It is a weak form of the undulatory pulse. The size of the artery is not of the same inequality at all times. There are waves of pulsation, the whole artery not being distended at the same time (Broadbent). See **572**.

542. *Formicant Pulse.* This is the smallest, most feeble and hurried of all the pulses. [It is not a quick pulse, though apparently swift. (Aeg.)] It differs from the vermicular pulse in the great ease with which upward rise, anteposition of beat or postposition is perceived. Irregularity of breadth is not discernible. [It is a weak form of vermicular pulse ; and allied in character to the " hectic " pulse.]

543. *Serrate Pulse.* This [modern " harsh "] pulse resembles the undulatory in the inequality of the various components of the beat—upward rise, breadth, anteposition and postposition. It differs, however, in appearing harder, and in its components being of unequal hardness. This pulse is quick, hurried, hard. The irregularity is in respect of size of expansion, of hardness and of softness (see **565**).

544. *Mousetail.* There is progressive inequality of the components—from decrease to increase, from increase to decrease. This may apply to several beats or only to one beat or only to a part of a beat. The inequality is in respect of volume, or of slowness (changing to swiftness), or of weakness (changing to strength).

The artery, says Aegineta, feels swollen to the index finger, and very slender to the last finger. He speaks of a " failing or swooning myurus, where the smallness of the last beat is maintained ; and of a recurrent myurus, where the pulse resumes its original amplitude."

545. *Recurrent* [modern " flickering " pulse]. This passes from minuteness to a certain volume, and then fails progressively until it reaches its former minuteness. It is like two myuri placed together end to end.

" Your first finger feels it small, your middle finger feels it large and swelled, and your little finger feels it small ; the expansion is only slight."—(Aegineta.)

Cause : weakness of arterial wall, and wasting of the tissues round the artery. Significance : extreme debility ; wasting from unresolved inflammation or any other cause.

546. *Dicrotic.* Doctors are divided in opinion about this pulse. Some regard it as a single beat in which antecession and post-position are unequal ; others regard it as a double pulse, one beat following the next too quickly to give time for the second to produce full expansion. However, the presence of two beats does not make two distinct pulses. A pulse which makes a partial expansion and then resumes it, would not be dual. It would only be dual if the artery were to fill first, and then pause and then contract and again refill ; but otherwise it would virtually be a jerking pulse.

§ 222. As regards the dicrotic pulse, some have regarded it as a wave reflected from the periphery, but it is really the elastic recoil of the aorta that accounts for it. It is most distinct if the peripheral resistance is low. The semilunar valves form the fulcrum of the rebound (Broadbent, p. 26).

The first beat of the pulse is large, the artery rising strongly to the finger ; then it stops and recedes ; the second beat is small. The artery is as if repelled at the first beat and then trembles a little, and then quickly resumes its beat but less strongly, and at too short an interval.

547. *Fading or falling pulse.* Here there is a pause in the middle of the pulsation, as there is in the gazelle pulse. But in the gazelle pulse the second beat begins before the first is finished; in the falling pulse the first beat is completed before the second begins.

548. *The spasmodic, thrilling and twisted pulse.* The latter is compared with a twisted thread ; there is here an irregularity between the precession and the later parts of the pulsation, both in position and in breadth.

The spasmodic (or "tense ") pulse suggests that the artery is being stretched and dragged and pulled by its extremities like a cord (Aeg).

The " thrilling " (modern term), or tremulous pulse is hard, quick and frequent. It suggests the quivering of arrows thrown with great force (Aeg.).

549. *The chord-like pulse* feels like a twisted cord (or sinew), and is similar to the thrilling pulse. But in the chord-like pulse the expansion is less conspicuous ; the departure from regularity of position of rise is less evident ; but tension is evident ; the twisting is sometimes only in regard to one portion of the pulsation. The two kinds of pulse are really equally common, and equally liable to occur in " dry " diseases.

All the above are simple pulses.

550. The varieties of compound pulse (that is, where there is more than one form of inequality or irregularity at once) are almost innumerable. In any case they have received no special names.

Additional Notes

§ 223. 1. The pulse is *visible* under the following circumstances : when the radial artery follows an abnormal course, immediately under the skin ; when the patient is spare, and the skin is thin ; when the tension is very high, and the blood-vessels are enlarged and tortuous ; and (entirely pathologically) in aortic regurgitation—where the artery is empty and collapsed between the beats, and the blood rushes in with extreme suddenness and violence, especially if the hand is raised. Such a pulse may be *audible* as well, and at the same time there is conspicuous throbbing of the carotids and temples and facial artery. The tension is here very low indeed.

Visibility is not mentioned in the Qanun ; and whether the " empty " pulse is comparable at all with the " Corrigan " or not, is not clear. It seems hardly likely that so striking a pulse should not have been observed, even though they could not know its explanation.

§ 224. 2. *Hectic pulse.* This occurs in marasmus and phthisis. The components do not vary greatly. The pulse suggests " being entangled, and never getting free," because the state of disease is actually diffused throughout the body. This pulse therefore agrees with the Chinese type named " like a toad embarrassed by weeds." This may be simply a form of the " thrilling " pulse.

§ 225. 3. *Pulse-rate.* (Broadbent,[115], etc.)

Increased pulse-rate.—Lowered resistance quickens the pulse rate. *Diurnal variations :* the pulse-rate is greater in the evening, and slower in the early morning. The fact of the latter explains the following : morning headache ; tendency to depression of spirits ; to awake tired ; the tendency to asthmatic attacks and epileptic fits (the blood-pressure is now minimal). *Posture :* the erect posture adds eight beats to the minute. *Emotions :* the rate is increased by fear (the force is feeble), and anger (force violent) ; the explanation is that the tension is increased by the emotions. *Exercise :* at first the rate is increased as well as the force and the pulse becomes " vehement." The explanation is threefold—(*a*) nervous factors ; (*b*) muscular action drives more blood to the heart and fills up the right side ; the heart has to beat quickly and strongly to get it through the lungs ; (*c*) accumulation of blood in the lungs produces breathlessness and panting. *Food :* the rate is increased after food, and the vessels are relaxed. *Drugs, etc. :* stimulants increase the rate and cause greater relaxation of the vessels ; alcohol and ether belong to this category. They lower the peripheral resistance by acting on the central nervous system, and also stimulate the heart directly ; nitrites increase pulse-rate, and at the same time cause great relaxation of the artery. Pungent essential oils and ammonia increase the rate and through the peripheral nerves relax the vessels. Belladonna and atropin also increase the rate. *External warmth :* slight increase of rate and slight relaxation of the vessels. *Respiratory movements*—cause irregularities.

§ 226. *Increased pulse-rate in relation to morbid states :*—

These diseases in which the rate is increased, show the same rate, even in repose, but exertion makes the rate increase inordinately, out of all proportion. Emotional disturbance has the same effect.

In pyrexia: the rate rises according to the degree of fever, but chiefly according to the effects on the system and according to the patient's reaction to the disease. The peripheral resistance falls. The force may be increased (sthenic fever: pulse frequent, sudden, vehement, large, short, dicrotous) or diminished (pulse weaker, less sudden, less large, dicrotous). Towards the end of the illness, the weaker the patient, the greater the rate; even a few beats more per minute are serious. In septic fevers (septicæmia: modern term) a quick rate forewarns of shock, and a fatal issue (in puerperal cases). A " racing " pulse is a danger sign.

Among special fevers: scarlet fever is characterized by a very quick pulse-rate (120-200).

§ 227. *Specially quick pulse-rates.*—In young people: overstrain from athletics; the " irritable heart " (the blood-pressure is high). In older people: sudden single acts of excessive exertion (sudden dilatation of the heart). Special cases: paroxysmal tachycardia: due to flatulence, emotions, gout; gastric trouble. The pulse is frequent, short, variable in fulness and strength, not vehement, occasionally irregular. The heart-sounds are confused and short, and cannot be analysed. May arise suddenly from a fright or sudden noise, or violent emotion.

(In this condition the motion of the blood is not accelerated. It is a vibratory alternation of pressure with little onward movement. The left ventricle is not dilated. It may be that the ventricle is not expanding properly. Cf. auricular fibrillation; auricular flutter. This form of pulse must be among those described by the Chinese, but certain identity has not been reached).

The quick pulse of " Graves' disease " might be included here.

Middle-aged and elderly women: here the occurrence of throbbing aorta may be referred to, though it is not a true " quick pulse "; it arises from lack of tone in the aortic wall.

§ 228. *Decreased pulse-rate.* Increased resistance slows down the pulse. Habitually low pulse-rate (bradycardia) forewarns of the risk of cramp when swimming. In this category belong—the slower rate of jaundice; of fatty degeneration of the heart (not often met with here); the special pulses: pulsus bigeminus and pulsus trigeminus: heart-block.

§ 229. 4. *Intermissions. Irregularity.*

On the one hand there is a variation of force between successive beats; on the other hand there is a drop of a beat, or an interposition of a beat.

Intermissions may be habitual or constant, the person being unconscious of it except during exercise or excitement. It is accentuated when the body is fatigued or the disposition is nervous. The patient is conscious of it during pyrexia.

Occasional intermissions are produced in shock; in hypochondriasis after the use of tobacco; in fatty degeneration of the heart. In these cases the heart itself is beating, though hurriedly and imperfectly.

Irregularity is habitual in mitral regurgitation, where it is produced by the variations of pressure dependent on breathing. Inspiration forces blood into the left ventricle, expiration sucks it out of the left auricle. A similar occurrence is found when the heart is dilated, and under nervous conditions.

Irregularity is occasional as a result of flatulence of the colon, or stomach, which disturbs the action of the diaphragm; as a result of tobacco.

Irregularity is usually more serious than intermission.

Rules in regard to intermission found in Chinese textbooks:—Omission of one beat after forty shows a lack in one of the five " noble " organs: " death will follow in four years, in spring." If there are no intermissions within fifty beats, the health is perfect. But if there is an intermission then, it has a similar significance to the preceding and shows " death will follow five years later." (See § 218.)

Other rules cannot be presented without also discussing the theory of the relation between pulse-type and physiological value of the several organs. Thus an intermission of one in 12, or 19, or 26 (and so on), beats differs in significance according as the pulse-type is " heart," " lung," " liver," " kidney," and so on.—After all, such a classification is justified, and it should be easily understood that intermissions under such circumstances might have distinct significances.

§ 230. 5. *Relation of pulse-rate to respiration-rate.* In the Chinese works this form of observation replaces our own habit of estimating the number of beats per minute, and also the number of respirations per minute. In health there should be four beats to one respiration; five beats in the same period is allowable as consistent with health. But over five is pathological, and eight beats is a bad prognostic sign. A reduction to three or two is pathological and a reduction to two is a bad sign. When death is imminent there may be only one beat to two respirations. Full details are stated to be given in " the book of eighty-one difficulties."

4. The Pulse designated as "Natural."

551. Each of the above-named varieties (of pulse) necessitates a distinction into "increased" and "diminished." And that which is "natural" among them is the "equable" pulse, except in the case of the strong sort. For (here) the "natural" pulse is excessive as to strength. But in other cases, the increase is in natural proportion to the increase in force, so that, for example, as it becomes greater, it is "natural" for it also to be forcible.

As for the sorts (of pulse) in which there is no possibility of increase and diminution, in such cases the "natural" pulse is the one which is even (equable), regular (orderly), and of good rhythm (weight).*

Paraphrase.

Amongst all the varieties of pulse which have now been described, there are two classes. (i) Those which show degrees of qualities: namely, increase above, and diminution below, a "mean." (See **521-528**). (ii) Those which do not. Thus, a dicrotic pulse cannot be more, or less, or intermediately dicrotic; an irregular pulse cannot show a "mean" irregularity.

The "natural" pulse in the first group is one which shows a mean quality in respect of every feature except that of strength (**523**) for the natural pulse *is* strong (forcible).

The "natural" pulse in the second group is one which is uniform, regular (orderly), and eurhythmic.

This rendering brings out the real meaning of the word "natural"—tabiʻyya. It is not synonymous with "normal," but refers strictly to "the nature"—i.e., the state of the vegetative soul, when in health.

In short, a pulse which is "muʻtadil" is not therefore necessarily "normal"; still less is it necessarily "natural."

A pulse may be (*a*) natural and normal, (*b*) not natural, yet not abnormal, (*c*) not natural, and also abnormal.

5. The Factors concerned in the Production of the Pulse

552. The factors concerned in the production of the pulse are (i) essential and integral in the constitution of the pulse. These are called "contentive" factors; (ii) non-essential: comprising two groups, (*a*) inseparable—that is, if they were altered, the type of the pulse would be altered; (*b*) separable;

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* It may be noted that the close resemblance between the Latin version and the corresponding passage in Galen makes it seem as if Avicenna had simply introduced a translation into Arabic from Galen. But in the Greek the natural pulse is simply a mean between extremes, and is so called presumably because usual in health; whereas with Avicenna this is not so; he speaks of a distinct kind of pulse, and is truly consistent to his usage of the term "nature"—the outcome of the great thesis "the body is a unity"—throughout his physiology, pathology, and sphygmology.

that is, a change may be produced in them without affecting the type of the pulse.

There are three contentive factors :

1. The (vital) power of the heart, producing the expansion.
2. The elasticity of the artery.
3. The resistance, or urge.

The last-named is, in Avicenna, taken to be a question of the degree of innate heat, and its relation to heat-loss ; not a question of peripheral resistance as a factor in producing blood-pressure.

The influence of the three factors varies with the non-essential factors which may be associated with them at the given time.

553. *List of non-essential factors :*

1. Natural (i.e. pertaining to the nature)—Age (manhood, youth) ; temperature of air (hot seasons ; hot localities) ; temperament (hot temperament).

2. Non-natural : exposure to very hot atmosphere ; use of hot baths ; vigorous exercise or gymnastics ; influence of food and wine ; influence of calefacient medicines.

3. Preternatural : emotional states ; secretiveness (hiding anger, concealing the fact of having taken a heating medicine in spite of the physician's enquiry) ; cunning persons who easily conceal matters relative ; habits of the patient ; " hot " intemperaments ; decompositions occurring in the fluids (in the stomach or tissues).

6. The Effect of the Contentive Factors upon the Pulse

554. *Large Pulse.* If the arterial wall is at the same time yielding, and the vital power is strong, and the resistance excessive, the pulse will be large. The resistance is the chief factor in the production of a large pulse, for should the power fail, the pulse will naturally weaken ; and if the arterial wall were also hard, and the resistance lowered, the pulse would be even smaller.

An unyielding artery will also make the pulse small. But the difference between a small pulse due to inelastic artery and one due to weakness is that in the former the pulse is hard and not weak or short or low as in the latter.

Low resistance also makes a small pulse, but it is not weak. Weakness is the chief cause of all three forms of small pulse. Granted the power is constant, lack of hardness of the artery has more effect than lack of resistance, for there is nothing to prevent the artery from expanding.

The temperament has not much influence unless the resistance be lowered.

If the resistance be great and the power strong, and the artery inelastic, the pulse becomes swift. The swiftness makes up for lack of size of pulse. But if the power be not adequate, and the pulse is therefore unable to become large, and therefore not swift, it necessarily becomes brisk, and this briskness makes up for the lack of volume and swiftness. Several beats of this kind would become equivalent to the effect of one adequately large beat, or of two swift beats.

555. It is like a man wishing to carry a very heavy weight ; if he is able to do so, he will carry it in one journey, though with difficulty ; or he may divide it into two, thus making each journey more easily ; or, if he cannot manage even that, he will divide the load into many portions, and carry each one as leisurely or as quickly as he wishes. He need not rest himself between the journeys, though he may choose to linger. But if he were very weak, he would stop and rest awhile between the loads, and as he becomes tired with the journeys would perform them more slowly.

556. If the vital power be strong, and the artery responsive, and the resistance moderate, the effect of the power would be to make the pulse more swift and of greater volume. But if the resistance were greater, there would be briskness as well as large volume and swiftness.

557. The factors which go to make a large pulse also go to make a long pulse, if rise and fall are hindered in any way. For instance, a hard artery cannot widen, and tough flesh and skin, especially if the tissues be wasted, prevents the artery from rising to the finger.

Variants of Large Pulse, and their causes (Aeg.) :—

Large and also soft : hot baths.
Large and also hard : hot intemperament, especially if there is dryness of the system.
Large and mean between hard and soft : massage ; exercise.
Large and vehement : wine ; anger.
Large and unequal : concealing anger ; deceiving the doctor in regard to definite questions, as to possibility of heating factors.
Large and also a hasty contraction : putrefactive changes in humours.
Large and also quick and dense : increase of heat in the heart from various causes.
Large only in appearance : emaciated state of the tissues at the wrist.

558. *The Causes of Pulses bearing Distinctive Names*

Broad Pulse. Emaciation may make a pulse appear broad.

Emptiness of vessel also makes a pulse appear broad, because the two walls come into apposition. A very soft artery gives the same effect.

Causes of broad pulse: redundance of humidity from natural causes or from external causes, such as a soft artery (Aeg.).

559. *Hurried pulse.* The causes of a hurried pulse are: weakness; great resistance; heat.

560. *Sluggish pulse.* The causes of a sluggish pulse are: power relatively greater than resistance; great coldness due to resistance; great loss of vital power; approach of death.

561. *Feeble pulse.* The causes of feeble pulse are: loss of natural power by lack of food; emaciation; excessive discharges; insomnia; too much exercise; solicitude; morbid change in the humours; movement of the humours, especially into a very sensitive member, or into a member which is in relation with the heart; any source of intemperament; pain (producing syncope); sadness, grief and other mental states or cares; any factor whereby the vitality is markedly depressed. (Note also: age, season, locality; temperament.)

Cause of change from feeble pulse to strong pulse: (*a*) when the vitality becomes strong again, after being enfeebled from lack of food, wakefulness, immoderate evacuations, grief, cares, syncope, or any cause of intemperament. (*b*) When humours are matured; when noxious substances are excreted, when there is passion, when an intemperament is rectified; also after use of certain foods, of wines; after exercise. (Aeg.)

562. *Hard pulse.* The causes of hard ("tense") pulse are: dryness of the arteries and great stretching of the arteries; intense cold. The pulse may become very hard at the crisis of an illness owing to the intensity of the conflict between the person and his disease, for all the members are implicated. (This pulse is usually also small, quick, and sometimes frequent.)

Hard pulse must be distinguished from a strong pulse. The latter is usually also large, swells up and strikes the finger forcibly. A hard pulse cannot be large, for the artery is unyielding; a hard pulse is also small, quick, and sometimes dense. (Aeg.)

Causes of hard pulse: hardness of artery; this is due to immoderate cold, dryness, or tension of inflammation, or spasm. (Aeg.)

Cause of strong pulse: the force of natural vitality, associated with hardness of the artery (Aeg.).

563. *Soft pulse.* The causes of soft pulse are: "natural" agents with an emollient action, such as aliments (more abundant diet; liquid food). Morbid states which tend to emollient effect: e.g. dropsy, sleepy-sickness, coma, disorders arising from or in a serous humour. Mental states, such as hilarity. Agents which are neither "natural" nor morbid: e.g. bathing (to excess).

Other causes (Aeg.): humid state of artery due to (*a*) preternatural causes: coma, lethargy, dropsy, affections related to the serous humour. (*b*) Non-preternatural causes: more liquid food, much sleep, a more abundant diet, immoderate baths; hilarity.

564. *Irregular pulse.* If the vital power be maintained, the cause will be heaviness [in substance] of the food, or of some humour. If the vital power be weak, it shows a contest between causative agent [of the illness] and the tissues. Other causes: (*a*) overfullness of the vessels. This would be remedied by venesection. (*b*) Viscidity of the blood. In this case the breath becomes choked in the vessels. This form of pulse is especially liable to occur when the breath is also imprisoned in the cardiac region—e.g. by an over-full stomach, which produces this effect very rapidly; or by anxiety; or by pain.

If the stomach contain depraved humour, the irregularity increases until cardiac tremor comes on, and a thrilling pulse (tachycardia !) results.

If the irregularity is orderly, it betokens lesser constitutional injuries; if disorderly, it shows that there are more serious constitutional defects to deal with.

565. *Harsh pulse.* This pulse shows a varying consistence of the artery which is produced by changes in the composition of the (circulating) humours, whereby decomposition products, "crudities," or products of maturation diffuse through the vessel wall and affect its mode of expansion. Inflammatory deposits in fibro-muscular organs (e.g. diaphragm, pleura: Rhazes) also render the pulse harsh.

If the harshness be slight, it shows that the inflammation is mild; if more marked, it means that the case is severe and dangerous, with a danger of empyema or tuberculous change (Aeg.). See **543**.

566. *Dicrotic pulse.* Vital power is strong; the artery is hard; the resistance is considerable. The artery does not at once yield to the force. It suggests a person wishing to sever something at one blow, but failing to do so until helped out, for instance by a sudden dire need to achieve it. (Significance: approaching crisis).

567. *Mousetail.* Such a pulse is produced when the vital power is weak, as a person who ceases manual labour, or is resuming it after a rest. If it is constant, it shows that the loss of power is greater. However, as long as the pulsation is mousetail in type (and the similar forms) it shows that there is some vitality left. But it is apt to pass on to the terminal mousetail, then to continuous mousetail, and finally end in the grave "recurrent mousetail" ("swooning" pulse).

Recurrent mousetail means: (*a*) failing vital powers, with a greater or less degree of prostration; (*b*) weak power, which is still struggling on in face of the odds (Aeg.).

568. *Fading or falling pulse.* The vital power is enfeebled or waning, and inadequate. It is also produced by a sudden change in the "nature" and in the mind.

569. *The spasmodic or tense pulse.* This is produced when there are non-natural movements in the vital power or when the artery is itself unhealthy.

Significance: inflammatory changes at the nerve-origins (meningitis, acute epilepsy). It can be felt after death has taken place, while the body is still warm (Aeg.).

570. *Thrilling pulse.* Here the vital power is strong; the artery is hard; the resistance is great. Without these conditions it cannot arise.

It denotes inflammation in fibro-muscular tissues which are well supplied with nerves. A strong expansion is required, with adequate vital power. The hardness of the artery prevents adequate expansion.

571. *Undulatory pulse.* This usually means chiefly a lack of vital power, expansion being hardly achieved, if at all, and then only little by little. If the artery is soft, this would itself suffice to produce the effect of waves, even though the power were not much reduced. A soft and moist artery does not respond to an impact, and does not allow every part to be expanded; whereas a dry and hard artery does—dryness being responsive to impact and tremor. An artery which is both hard and dry will transmit expansion at once; the soft and moist artery will only do so at the beginning of the pulsation, expansion and alteration of form of the vessel subsiding suddenly so that the other fingers do not perceive any movement.

The beats are indistinct; the dicrotic waves blend. At the same time the first cardiac sound disappears.

Significance: crisis approaching by sweat (Rhazes, Haly Abbas), or by bowels; humid affections like sudden dropsy, lethargy, peripneumonia (Aeg.); typhoid fever; and malaria; extreme cardiac asthenia (Broadbent).

572. *Vermicular and formicant pulse* are produced by great weakness, and so the pulse is sluggish, the intervals between the beats are short, and the components are unequal. This is because the artery is unable to expand at once, but only little by little. (See **541**.)

Significance: sudden loss of vital power due to excessive haemorrhage, diarrhoea, cholera, etc. Failing life (Galen).

In the formicant pulse the powers of life are at a still lower ebb than in the case of the vermicular pulse (Aeg.).

Chinese simile: to a silk thread (§ 214).

573. *Pulse of faulty rhythm.* If this occurs during a time of repose, it is due to an increased resistance. If it occurs during exercise, there is an increased weakness (of vital power) or deficient degree of resistance. The pulse of exercise produced by swiftness of expansion is something different to this.

The duration of the pause is lessened in old age. Equality between expansion and pause denotes a normal temperament of the body. It occurs in early life. If the pause is greater in duration than the expansion, the temperament is hot (e.g., adult). If the pause is less than the expansion, it shows that the temperament is cold (e.g., the aged).

Change of rhythm changes the rate and frequency of the pulse. (Aegineta.)

The causes of full, empty, hot and cold, deep (high) and low pulses are evident.

Full pulse is produced by plethora from food or wine; or any mere abundance of fluid-intake; empty pulse is produced by lack of nourishment, or undue discharges. The pulse *feels warm* (*a*) if there is great heat in the heart—the rest of the body being cold; (*b*) if the artery is in a sort of spasmodic state; (*c*) in catalepsy, and in persons who are becoming comatose. (Aegineta, quoting Archigenes.)

§ 231. *The influence of low resistance* upon the pulse. There is a sudden impact; the acme is brief; the subsidence rapid and the dicrotic wave is present. As it subsides quickly under the fingers it is called hurried. If at the same time the heart beat is forcible, the pulse is "full and bounding"—large, sudden impact, vehement; artery easily flattened. If the heart is beating feebly, the artery is narrow; the pulse is small, easily compressed; the impact is not sharp, and therefore the fingers must be applied very lightly in order to be able to feel the pulse. An extreme degree of this kind of pulse constitutes the "running" pulse. Sphygmographic variants are: hyperdicrotic, and "anacrotic" (which is a form of "gazelle").

Clinical causes of low resistance: (*a*) congenital. (*b*) transient: after a hot bath, in fatigue, in exhaustion; after a meal, especially a hot meal; lack of nitrogenous aliments; alcohol. (*c*) Emotional: anxiety, depression. (*d*) Morbid states: obesity, fever; flatulence; constipation; sleeplessness; headache; nervous conditions; chlorosis; fatty degeneration of heart.

Other facts.—A low resistance occurring in a person with a high tension is a bad sign; a person suffering from habitual constipation, and having a low blood-pressure, should not be given purgation, much less mercurial purgation.

§ 232. *The influence of high resistance* (high tension) on the pulse. This depends on the force of the heart. The pulse is full between the beats; the artery feels like a tendon or the *vas deferens*; or is even visible under the skin. The artery is large or small. It may be thrown into a curve; there may be nodosities along the artery. The wave is gradual; lasts too long; subsides too slowly; seems weak, but is more plain when one presses harder. There is no dicrotism.

A variant, called "virtual tension," is where the artery is large and full between the beats; moderate pressure does *not* make the pulse seem stronger; it is compressible; the impact is sudden, the acme is short, and the subsidence is sudden. Such a pulse shows that the heart is unable to cope with the resistance.

Clinical causes: excitement; exertion; external cold (which drives the blood from the surface); migraine; early meningitis; early acute nephritis (the water cannot get out through the kidney); plethora; presence of certain waste products in the blood which cause the small vessels to contract.

§ 233. TYPES OF PULSE AND VARIOUS CONDITIONS (MODERN).

Sleeplessness.—Two types of pulse. (*a*) Impact gradual; acme long; may subside suddenly; artery large or small; full between beats, and usually not easily compressible. It may be weak and yielding. The condition in this respect depends on the state of the heart. (*b*) Impact sudden; acme short; artery full between the beats; low tension. A sleepless person with such a pulse will be able to sleep readily in the daytime; he may be able to sleep sitting up though unable to do so lying down. The pulse is unstable.

Emotional excitement.—Impact strong; rate increased.

Fevers:—

Catarrhal. The pulse varies according to the degree of obstruction to the pulmonary circulation (bronchitis, e.g.).

Pneumonia. Pulse frequent, large, vehement, dicrotic, not short, not compressible. The pulse can be felt with the third finger after pressing hard with the index finger, because the pulsation goes round the radial arch. When the lungs become engorged more and more, the artery is small, the beat is weak, but the heart itself is very forcible, working hard to get the blood round the lungs. Violent heart action and weak pulse! (Venesection indicated!)

Diphtheria. At first the pulse is weak and small especially if the heart is affected. The heart rhythm is *ab/c/d/d* or *ab/c/d/d/d/d*.

Erysipelas. Large, soft, very dicrotic; tends to become undulating.

Septicaemia. Artery small; pulse rate 140-200; beat sharp; compressible; "tick-tack" heart. The pulse varies much in different cases.

Pyaemia. Pulse frequent, and sharp, apart from the degree of pyrexia. The pulse is that of shock.

Acute rheumatism. The character of the pulse varies with the degree of inflammation in the joints, etc.

Inflammation of serous membranes. First, small, long, frequent, hard, full between beats; not easily compressible. Later—shock: very small, weak, compressible; "wiry" or "thready" pulse due to the filling up of the abdominal vessels. These characters are more noticeable with peritonitis than with pleurisy.

Cerebral conditions:—

Tumour. Rate slow; artery full between beats. Later on the impact is very weak, and the acme short; the artery small; the artery empty between beats (denoting feeble heart and relaxed arteries).

Coma. The pulse varies with the state of the heart.

Convulsions. Impact strong; rate increased; tension lowered; the blood-pressure is sometimes increased, sometimes low.

Epilepsy. Low tension is a bad sign; if a high pressure is present and continues, the case is tractable. The tension is always high in senile cases.

Meningitis. Early cases show the "hesitating" pulse; the force is not quite constant; the time is not quite regular. The impact is deliberate, the acme long; the artery is contracted. The rate is slow. Later on, the rate becomes quick; there is no tension (owing to compression of the brain).

7. THE EFFECT OF AGE AND SEX ON THE PULSE

574. *Male Sex.* The pulse is larger and much stronger, because the vital power and the resistance are both marked. The pulse is slower and more sluggish than in women because the degree of resistance is so great.

If the vital power is maintained, and the pulse is brisk, it must needs be swift. Swiftness comes before briskness. Hence the pulse of males is slow, and is necessarily also sluggish.

575. *Late childhood* (7-14). The pulse is softer because the temperament is moist at this period. It is weaker and more brisk because the innate heat is abundant. The vital power is not great, for growth has not yet become complete. Considering the small size of the body at this age, the pulse is large. This is because the artery is very soft and the resistance strong, and the vital power is not small—considering the small bulk of the body (at this age). Compared with the pulse of adult life the pulse at this age is not large but quick and more brisk (due to the resistance). This is because at this period of life there is a greater aggregation of "fumosities,"* consequent on eating so often and so liberally—wherefore more frequent evacuation becomes called for and "ventilation" of the innate heat is desirable.

576. *Early adult life* (21-35). The pulse is large, not very swift—indeed inclined to be slower and less brisk; the tendency is to become sluggish. At the beginning of this period of life the volume of the pulse is greater; and at the middle of the period it is stronger. The innate heat, as we have stated, is about the same in adolescents and in young adults; there is therefore about the same resistance in each. The vital power is greater at this period, and the greater volume of pulse therefore compensates for the lack of swiftness and frequency. Vital power is the main reason for the pulse being large at this time of life. The resistance is next in importance, and the state of the arterial wall is the contributory factor.

577. *Elderly persons.* The pulse is here smaller because of the weakness of the vital power; the swiftness is lessened both because of this and because of the lessened resistance. Such a pulse is therefore more sluggish.

578. *Old age.* In advanced years of life, the pulse becomes small, sluggish, slow. If it be also soft this is because of extraneous, and not natural, humours.

§ 234. From the Chinese.—In the male *sex*, the pulse at *W* should be more brisk than at *C*; in the female sex it should be more brisk at *C* than at *W*. From deviations of normal character of the pulse in women one may become aware of menstrual errors; of the presence or not of pregnancy, and the size of the pregnancy. The *C* pulse is noted for these purposes, and the right arm is used.—The exact details required for diagnosis require the application of the special nomenclature of pulses which is richer in variety and subtlety than that of the list of § 213.

Age. Bloom of life: pulse firm and full; persons of nurture may show a slow thin, even soft, pulse, uniform at *C*, *W*, and *G*; if not uniform, such a pulse is a sign of shortness of life.

Old age: the pulse is slow and weak. Some old men have "the pulse of long life"—strong, firm, fairly swift, not skipping. (The presence of a skipping or hesitating character would show that the strength of the person is outward, and that life would not reach an extreme length.)

8. The Pulse in the Various Temperaments

579. *Hot temperament.* The resistance is great. If the vital power and artery correspond, the pulse will be large. But if one of them do not correspond, the pulse will vary in the manner already described.

If the heat is not due to an intemperament, but is natural, the vital power will be very strong, and the heat increases. But one must not suppose that the increase of innate heat, to however great an extent, will lessen the vital power. For, on the contrary, the power of the breath becomes greater, and the mental qualities show more boldness.

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* Dukhānī; lit. smoke or mist.

If the heat arises from intemperament, the greater the degree of heat, the greater the weakening of vital power.

Cold temperament. The pulse is reduced in breadth, and so becomes small, slow and infrequent (sluggish). If the artery is soft, the pulse increases in width, and also becomes slow and infrequent. But if the artery be hard, the breadth will lessen. The weakness produced by a cold intemperament is greater than that produced by a hot intemperament because the heat of the latter, for instance, is then more correspondent (i.e. in slowness or activity) than is the innate heat.

Moist temperament. The pulse is here soft and wide.

Dry temperament. The pulse becomes hard and wiry. If the vital power be strong and the resistance great, the pulse will become dicrotic, or spasmodic, or thrilling.

These remarks will suffice in regard to the relation between the several temperaments and the simple types of pulse. The effect on composite pulses can be worked out from the principles already explained.

580. It may happen that a person may have a dual temperament, one side being cold and the other hot. The pulse will then be different on the two sides, according to the heat and cold respectively. In the one case it will be like the pulse in hot temperament ; in the other like that in cold temperament. From this we learn that the expansion and contraction of the pulse is not merely an effect of the ebb and flow of cardiac action, but there is also an expansion and contraction of the arterial wall itself.

9. The Effect of the Seasons on the Pulse

581. *Spring.* The pulse is equable in all respects except in strength, which is above the mean.

Summer. The pulse is quick and brisk, because of the resistance. It is small and weak because the vital power is dispersed by the dispersal of the breath (which in its turn is due to dominance of undue external atmospheric heat).

Winter. The pulse is more sluggish, slow, weak, and therefore small. This is because the vital power is lessened. In some people the heat is retained interiorly and aggregated together, thus making the vital power stronger. This is especially so if the temperament is hot, for then the external cold is overruled and prevented from passing inwardly, as would otherwise occur.

Autumn. The pulse is unequal and tends to a certain weakness. The inequality is due to the frequent changes of temperament which occur during this season owing to the fluctuations of temperature. The temperament is now hot, now cold accordingly. The weakness is due to two causes : (*a*) a contrary temperament always renders the injurious effect of a nocument greater than a similar but equable temperament would, even though that be a morbid one ; (*b*) autumn is a season antagonistic to life because at this period the innate heat is lessened and dryness dominates.

At periods between the seasons, the pulse corresponds to the adjoining season.

The pulse at each season also has its own appropriate *rhythm.*

§ 235. The following details from the Chinese work are tabulated for convenient survey :—

Month and Season.		Dominant element (Chinese name).	Type of Pulse.
First	Spring	mu	Tremulous : long.
Second	Spring	mu	,, ,,
Third	Fifth	t'u	Moderately slow : strong : hard.
Fourth	Summer	huo	Superficial : strong : "scattered."
Fifth	Summer	huo	,, ,, ,,
Sixth	Fifth	t'u	Mod. slow : strong : hard.
Seventh	Autumn	chin	Superficial ; short ; brisk.
Eighth	Autumn	chin	,, ,, ,,
Ninth	Fifth	t'u	Mod. slow : strong : hard.
Tenth	Winter	shiu	Deep : soft : slippery.
Eleventh	Winter	shiu	,, ,, ,,
Twelfth	Fifth	t'u	Mod. slow : strong : hard.

If the pulse proper to one season is met with during a different season, this is usually to be regarded as morbid, and may betoken a long or a short or a fatal illness according to the particular inversion. The autumn type in spring ; the winter type in summer ; the summer type in autumn, are grave signs.

It is to be noted that the third, sixth, ninth, and twelfth months form a fifth season, and are not counted under the corresponding season. These months therefore correspond to those named in Avicenna "periods between the seasons." The pulse changes are definitely specified in the above table, though only spoken of generally in the Canon.

10. THE EFFECTS OF LOCALITY ON THE PULSE

582. Some regions are temperate and vernal ; some are hot and aestival ; some are cold and winterly ; some are dry and autumnal. The character of the pulse will follow the statements made in regard to seasonal influences upon the pulse.

11. THE EFFECTS OF FOOD AND DRINK

583. Aliments (lit. substances entering the body from without) alter the condition of the pulse according to their quality and quantity. (*a*) By *quality*, one refers to the calefacient or infrigidant nature of the substance in question, which has a corresponding effect upon the pulse. (*b*) As regards *quantity*—if the amount of aliment is moderate, the pulse shows an increase of volume, swiftness and frequency, owing to the increase of vital power and innate heat resulting; this change in the pulse lasts a considerable time.

If the amount be unduly great, the pulse will become irregular and disorderly, because the burden of the food overrules the vital power; any overloading renders the pulse irregular. Archigenes thought that the swiftness of the pulse exceeded the frequency, as long as the excess of food existed. When the excess came to be less, the pulse would show an orderly irregularity.

If the amount be unduly small, the pulse becomes irregular both in volume and swiftness. In this case the duration of the change would be short because so small an amount of food would be rapidly digested.

If the vital power is weakened, whether the amount of food taken be small or large, the pulse corresponds in smallness and slowness until the digestion of the meal is completed.

If the natural (vegetative, digestive, maturative) faculty be strong, the pulse will be equable.

584. *Effect of wine on the pulse.* Wine has a notable effect on the pulse, in that if taken plentifully, being attenuated in nature, it gives rise to an irregular pulse, but not to so great an extent as other similarly nutrient aliments. This is because its substance is too rare, attenuated, and light. Being in actuality cold, wine, like other cold things, lessens the pulse-rate and makes it slow and infrequent in proportion to the rapidity with which it enters the body. Once it has become warmed by the body the initial effect passes off.

The heating effect of wine. The heating effect which wine produces is not very different from that of the innate heat, for wine is rapidly distributed through the body, especially if taken warm, and it undergoes rapid dissipation or resolution. If taken cold, it exerts an injurious effect on the pulse of a kind not shared by other cold articles of food, for the latter become warm only gradually and do not reach the blood as quickly as does wine, and they are therefore warm when they do so. But wine is absorbed so quickly that it has to be warmed by the blood itself, and this constitutes a noxa for such persons as are sensitive to cold. This injurious effect is not as great in degree if the wine is taken warm, because the natural faculty then counteracts it by breaking it up, distributing it through the body and finally dispersing it.

The cooling effect of wine. Wine has a cooling effect when it causes the natural power to fail, so that the pulse loses its strength before the wine has become broken up, distributed and dispersed.

Such is the manner in which the use of wine in quantity produces a heating or a cooling effect.

585. When we study the question of how the use of wine can make the pulse strong, other factors must be considered. Its own intrinsic character invigorates healthy persons ; it enhances the vital power by securing a rapid accession to the "substance" of the breath.

Although the heating and cooling effects above explained are injurious to most persons, there are some whose temperament is suited by it. Cold things, for instance, are tonic for persons of hot intemperament. For, as Galen truly said, the juice of pomegranate is strengthening for persons of hot intemperament ; honey-wine is tonic for those of cold temperament.

Wine may therefore be considered to be hot in nature, in that it is tonic for persons of hot temperament ; cold in nature in that it is tonic for those of cold temperament. Still, this question is aside from our purpose. We are concerned with the fact that is speedily accedes to the breath, as an intrinsic property ; and that from that point of view it is always invigorating.

The pulse becomes stronger if either the invigorating effect is exerted or the warming effect. It becomes weaker if neither occurs. By warming the body the resistance [i.e. the blood-pressure] is increased ; by cooling the body the resistance is diminished. But the usual action is that the pulse becomes stronger. Moreover, resistance [blood-pressure] is never increased without rendering the pulse more swift.

586. *Water.* Water has a similar invigorating effect to wine, because it is the means by which the aliment is enabled to permeate all through the body. But as it induces cold rather than warmth, it does not increase the resistance as much as does wine.

12. THE EFFECT OF SLEEP AND THE ACT OF WAKING ON THE PULSE

587. The characters of the pulse *during sleep* vary according to the stage of sleep and the state of digestion.

At the beginning of sleep, the pulse is small and weak, because the innate heat is then in process of retracting and withdrawing inwardly,* instead of expanding and travelling to the surface.

588. Difference between the " heat " in the first stage of sleep and that produced by exercise.—During the time of sleep, the innate heat is withdrawn inwards by the vegetative faculty in order to procure the digestion of the aliment and the maturation of effete substances. The heat is therefore, as it were, mastered and forced into service. The pulse is therefore more slow and sluggish in spite of the fact that the contraction and imprisonment of the heat in this region means a local increase of heat. For, in amount, this local heat is not so much as exists during the waking state, with its associated movements and exercise.

Thus, exercise is apt to create undue heat and " inflammation " up to an intemperamental degree, whereas there is only a moderate aggregation of heat when the innate heat is imprisoned, and so " inflammation " is less feasible. You know that this is so, because of the fact that exercise makes breathing laboured (forced), and hurried, incomparably more than when the innate heat is constricted and imprisoned by some other agent similar to sleep. For instance, to be submerged in tepid water brings about such an imprisonment of innate heat, and produces rapid respiration, yet not nearly to the extent produced by toil and exercise. Careful consideration shows that nothing increases the heat as much as these do. But it is not the mere exercise which accounts for this, as if resting would bring about a cessation of heat production. It is rather that the heat produced by exercise simply moves on the breath to the exterior parts, as long as generation of the breath takes place.

589. During the stage of sleep following the completion of digestion, the pulse becomes stronger. This is because vital power is added to by the digested aliment. The heat which had passed to the inward parts now returns towards the surface in order to regulate the nutrients passing thither, and also returns towards its source. This fact, and the fact that the temperament is made hotter by the products of nutrition explains why the pulse becomes of increased volume, and the arterial wall is softer because of the addition of the appropriate nutrients. There is no increase in swiftness and briskness along with the increase of volume, because mere increase of volume does not alter blood-pressure (lit. increase the resistance) either directly or indirectly; that is, by restoring the factors which directly raise the blood-pressure (lit. increase the resistance).

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* i.e., into the abdominal viscera, in whose veins the blood has now collected.

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The thought underlying this passage may be expressed as follows:—The person is supposed to have gone to sleep shortly after completing his meal. The body-heat is now concentrated round the digestive organs in order to render digestion possible. The surface of the body becomes cold. Later, when the first digestion is accomplished, the products are distributed to the various parts of the body. The heat now leaves the interior parts (i.e. the splanchnic system), and may be pictured as passing to the surface again, whence it had come (mabda'), so as to be ready to receive these digestive-products. Once more does it preside (lit. regulate, tadbīr), or brood over them so as to render possible the further (third and fourth) digestion which they are about to undergo in this new situation.

The pulse is strengthened by two factors: (*a*) the access of body-heat which has now left the abdomen; (*b*) the food-products. The latter affect the pulse in two ways: (i) indirectly, by making the temperament more hot; (ii) directly, by making the arterial wall soft.

The person, it will be borne in mind, is supposed to be still sleeping. If he continues to sleep, the pulse will change in the manner next to be described; if he awakes, the conditions also change, and the pulse alters as described below.

* * *

590. If sleep continues after the completion of digestion, the pulse again becomes weak owing to the aggregation of innate heat and the choking of the vital power by the undue preponderance of those effete substances which now await evacuation by channels only possible during the waking state—namely exercise, and the insensible perspiration.

591. If the body were fasting when sleep began, and there is nothing awaiting digestion, the temperament would tend towards coldness, and consequently the pulse would not only remain small, slow and sluggish but would become more so.

592. The *act of waking* has certain effects on the pulse.

When a sleeping person awakes, the pulse steadily gains volume and swiftness until it reaches the natural state for that person. But if the wakening is sudden, the change in the pulse will be sudden ; it will become rapidly weak, because the act of waking overrules the vital power. The previous large volume will reappear later, and the pulse will become quick, brisk and irregular (up to " thrilling "). The quasi-violent movement introduces great heat. The sudden stirring up of the vital power to meet the sudden change accounts for the irregularity and trembling of the pulse. However, the pulse does not remain long in this condition ; it rapidly becomes regular again. Seemingly potent though the agent is, its duration is so short that all trace of its effect is soon lost.

13. THE PULSE DURING (RIGOROUS) ATHLETIC EXERCISE

Note : the word " Exercise " includes (*a*) athletic sports of all kinds : running, endurance tests, sprinting, gymnastics of all kinds, military exercises, laborious manual or physical work ; (*b*) work in the fields ; (*c*) necessary exercise and walking exercise taken for health's sake and recreation ; (*d*) mental.

593. At the outset, as long as the exertion is moderate, the pulse is large and strong. This is because the innate heat increases, and is strong. The pulse is also swift and brisk. This is because the resistance becomes greatly increased by the exertion.

(The pulse is frequent, strong, and the artery is moderately contracted : [115])

594. As exertion continues and increases, even if it be intense for only a short time, the pulse weakens, and, with the dispersal of the innate heat, becomes small. The pulse remains swift and brisk for two reasons : (1) the degree of resistance (i.e. blood-pressure) is further increased ; (2) the vital power progressively fails until it is insufficient. After this, the swiftness steadily and progressively lessens ; and the briskness increases correspondingly to the lessening of vital power.

(Violent, but not excessive exercise, renders the pulse frequent, strong, sudden, vehement, large, short, dicrotous :[115])

Still further prolongation of the exertion weakens the pulse until it becomes formicant and very brisk.

(Exhaustion produces a frequent, sudden, short, not vehement, very dicrotous pulse. It is large unless the heart is very weak. Fatigue makes the pulse slightly slow ; the force is diminished, the arteries are relaxed.[115])

595. Finally, if the exercise has been carried on to an extremely excessive extent, it leads to a state akin to death, acting like all resolvents—that is, it renders the pulse vermicular, very brisk, slow, weak and small.

14. THE EFFECT OF BATHING ON THE PULSE

596. (1) *Hot bath.* If one bathes in hot water, the first effect is to make the pulse strong and raise the pressure. When the bath has brought about a dispersal of the vital power, the pulse becomes weak. Galen says it is small, slow in beat and sluggish. But while agreeing that it is weak and small; *we* say that the hot water acts first by increasing the interior heat of the body, like any extraneous heat, i.e. only temporarily. After a while the water resumes its cooling effect*—its natural quality. This cooling effect may persist. As long as its action as extraneous heat holds the field, the pulse becomes swift and brisk. But when its own natural character is resumed, the pulse will be slow and sluggish. If the incidental quality (of being hot) lead to so much loss of strength that syncope is imminent, the pulse becomes slow and sluggish.

(2) *Cold baths.* If the cold reaches to the interior parts, the pulse becomes weak, small, sluggish, slow. If it does not do so, but has the effect of aggregating the innate heat in the interior, the volume of the pulse will increase as the power increases, and the swiftness and briskness decrease.

(3) *Bathing in natural thermal waters.* If these have desiccant properties, the pulse becomes harder and its volume diminishes. If they impart warmth, the swiftness increases. If they dispel the vital power the pulse will come to be as described above.

15. THE PULSE IN PREGNANCY

597. The resistance is specially great in pregnancy, because the foetus shares in the mother's respiration. Both mother and embryo have their own resistance (blood-pressure), and there is as it were a double respiration. Nevertheless there is no doubt about the fact that the vital power is neither increased nor lessened, except to a degree consistent with a slight lassitude proceeding from the mere weight of the foetus. Hence the increase of resistance overrules the moderate amount of vital power, and the pulse is made of greater volume and becomes swift and brisk.

§ 236. The Chinese say: a pulse at *C* which is constantly superficial (or "swimming") or deep in an otherwise healthy woman, with amenorrhoea, betokens pregnancy; so also a high strong *C* pulse; a "slippery" pulse at *C* is a certain sign. An overflowing and high or deep and full pulse at the left *C* goes with a male pregnancy; a superficial and high pulse at the right *C* betokens a female pregnancy.

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* On the nervous system.

A number of other rules are given, the changes in the character of the pulse during the successive months of pregnancy being specified. Thus, first month: *W* pulse small, *C* pulse brisk. Third month: pressure with the finger makes the pulse seem to disperse. Sixth month: pressure does not alter the typical character. Seventh-eighth month: full, hard, strong pulse betokens a good labour. A deep and slender pulse forewarns of difficult labour.

Death of the foetus makes the pulse long and tremulous.

If the *C* pulse is continually small, weak, and sharp, and the nature is cold, with a tendency to shiverings, pregnancy will never be possible.

16. THE PULSE IN PAIN

598. Pain changes the character of the pulse according to (1) its intensity; (2) its duration; (3) its situation—whether the member affected is a vital one or not.

At first, pain stirs up the vital power, making it resist and counteract the pain; at the same time the cause of the pain increases the heat of the body. The pulse is therefore of large volume, swift and very brisk, the effort entailed in immobilizing the body [the reflex effect of the pain] accounting for the volume and swiftness. When the pain becomes less unbearable in one or other of the ways we have already explained, the pulse steadily declines in fullness until it has lost its size and swiftness; but these features are replaced by very marked briskness and smallness of beat, and hence the pulse becomes formicant and vermicular.

If pain becomes more and more severe, it makes the pulse sluggish and finally extinct.

17. THE PULSE IN (INFLAMMATORY) SWELLINGS

599. The formation of certain swellings is associated with fever, either because of their size, or because they affect some vital organ. The pulse varies with the changes induced in the body as a whole by the fever, as we shall explain in its proper place.

Afebrile swellings alter the pulse of the member itself, from their very nature. The pulse in the rest of the body may be altered secondarily—not because they are swellings, but because they produce pain (and restrict movement. Aeg.).

In sthenic fever, the pulse is frequent, sudden, vehement, large, short, dicrotous. In asthenic fever it is frequent, sudden, not vehement, large (unless the heart is weak), short, and very dicrotous. In peritonitis, the arteries are extremely contracted. (Broadbent.)

600. When an inflammatory mass causes a change of the pulse, it does so either according to (1) kind of swelling, (2) its phase, (3) its bulk, (4) the organ in which it occurs, (5) associated effects.

1. *Relation to variety of mass.* (*a*) If "hot," the pulse becomes harsh, and coarsely, and then finely thrilling ; swift, brisk. (*b*) If, however, there is an antagonistic humectant agent at work, the pulse ceases to be harsh and becomes undulatory. It is also always tremulous—coarse or fine tremor—and swift and brisk. Not only are there agents which will alter a hard pulse, but there are also agents which make a harsh pulse more decided. (*c*) If the mass be soft, the pulse is undulatory. (*d*) If very cold, the pulse becomes slow and sluggish. (*e*) If hard, the harsh pulse becomes still more harsh.

When abscess formation comes on, the pulse ceases to be harsh and becomes undulatory. This is because suppuration goes with moisture and softness. The pulse also becomes irregular owing to the weight of the mass, and the rate of briskness lessens owing to the fact that heat-formation ceases with maturation of the pus.

2. *Relation between phase of inflammatory process and character of pulse.* The larger the "hot" inflammatory mass becomes, the more harsh does the pulse become. The hardness and tension in the mass increases steadily, and as the pain increases, tremor appears in the pulse. At the acme, all the features of the pulse become more marked, except those depending on force ; the force of the pulse lessens and the briskness and swiftness increase. If the acme is prolonged, the swiftness lessens and the pulse becomes formicant. After the swelling subsides, whether by natural processes or by surgical interference, the pulse becomes strong in proportion as the tension in the swelling lessens ; and the pulse ceases to be thrilling because the pain ceases with the fall of tension in the tissues.

3. *Relation between bulk of inflammatory mass and the pulse.* A large mass denotes marked inflammation ; the pulse becomes larger in all respects, and each beat is prolonged. When the mass is only small, the pulse is smaller and more sluggish.

4. *Effect of the position in the body.* When the inflammatory process is situate in an organ or tissue rich in sensory nerves, the pulse becomes hard, and approaches the "harsh" type. If the organ is rich in blood-vessels, there is an increase in size of the pulse, and in force ; and it is very irregular. If arteries predominate—as in the spleen and lung—the volume is not maintained unless the force is maintained as well.

When it is situate in moist soft members (like the brain and lung) the pulse becomes undulating.

5. *Effect of secondary results of inflammation.* An inflammatory mass in the lung has a choking effect, and hence the pulse becomes thrilling ; in the liver, atrophy is produced and the pulse becomes like that found in wasting diseases ; in the kidney, strangury is produced, and there is suppression of urine, which alters the pulse accordingly. In members which are rich in sensory nerves (stomach, diaphragm), the pulse becomes spasmodic and swooning.

18. Effect of various Emotional States* on the Pulse

601. *Anger.* Anger stirs up the vital power and causes the breath (ruḥ) to expand all at once. Hence the pulse is large, rises high, is swift and brisk. It is not necessarily irregular because the passion does not change—unless there is fear present as well, in which case anger would prevail at one time, and fear at another. Irregularity may also occur if shame is associated, for the intellect warns the person to be silent and not yield to the same evil as did the person who has excited one to anger.

Excitement apart from anger.—The pulse is frequent, strong, and the artery is moderately contracted.—Note also the modern observation that " excitement always increases the blood-concentration, sometimes by as much as 10 per cent." (Barbour and Hamilton, Journ. Am. Med. Assoc., 1927, p. 91).

Delight. Here the movement is gradual and outwards. The pulse does not become as speedy and brisk as in the case of anger, but its volume is adequate for the resistance, and therefore the pulse is slow and infrequent.

Joy. The pulse is similar to the preceding, because usually large in volume, and soft ; it becomes slow and infrequent.

Grief. Here the heat is extinguished, or choked, nearly to obliteration, and the vital power is weakened. Hence the pulse is small, weak, sluggish and slow.

Fear. If of sudden origin, the pulse becomes quick, irregular, disorderly. If the state is prolonged, or more or less habitual, having begun insidiously, the pulse varies with the varying shades of anxiety.

Love.—" Now the lover's pulse is variable and irregular, especially when he sees the object of his affections, or hears her name, or gets tidings of her. In this way one can discover, in the case of the one who conceals his love and the name of his beloved, who is the object of his passion. . . ."—(Dhakhira-i-Khwarazm-shahi, Book vi. Guftar i, Juz' 2, ch. 3 ; E. G. Browne's translation,[7] p. 89.)

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* Nafsāniat. See § 160 iii, iv, and **174** sqq.

19. BRIEF SUMMARY OF THE CHANGES PRODUCED BY AGENTS ANTAGONISTIC TO THE NATURE OF THE PULSE

602. When the pulse is changed by such agents, it is either (1) because of an intemperament; and you know the effect of each of these upon the pulse; or (2) by confining the vital power, whereby the pulse becomes irregular. If the restriction be unduly great, the pulse becomes also disorderly and arhythmic. The degree of confinement varies with the amount of morbid material, whether there be an inflammatory mass or not. Or, (3) by dispersal of the vital power, whereby the pulse becomes weak. Here belong such agents as: severe pain, affections of the mind which produce a profound loss of vital power, severe or protracted diarrhoea.

§ 237. Pulse *in convalescence from acute disease:* the rate is normal or slightly slow; the force of the heart is diminished and the arteries are relaxed. The force of the heart and the arterial tone increase as convalescence advances. (Broadbent, p. 51.)

The "*renal pulse*": the frequency is normal or slightly diminished. The force of the heart beat is increased. The arterioles are contracted (*ib.*).

Urinoscopy

THE URINE

1. General Remarks

Precautions necessary in Collecting the Urine, before Forming an Opinion as to its Character

603. 1. It must be collected in the early morning* ; it must not have been kept over from the night before.†

2. The person must not have taken either food or drink before passing it.

3. The previous food must have been free from colouring agents like crocus and cassia fistula (these render the urine lemon yellow or ruddy), and from potherbs (which make the urine a greenish tint), and from salted fish (which renders the urine dark), and from intoxicating wines (which tend to render the colour of the urine similar to themselves).

4. The patient should not have been given an agent which expels some humour (a cholagogue or phlegmagogue) by the urine.

5. Physiological state. The patient should not have undertaken severe exercise or toil, or be in a praeternatural mental state ; for in each case the colour of the urine may alter. E.g., fasting, wakefulness,† toil, anger, dread—for all these cause the urine to become more lemon-yellow or redder in tint. Coitus also alters the urine, rendering it oily. Vomiting and defecation alter both colour and texture of the urine. The same happens if the urine is kept standing a while. This is why some advise urine not to be left standing more than six hours before examination, for otherwise the significance is altered ; the colour changes ; the sediment goes partly into solution ; and the density increases. Personally I think that such changes begin within an hour.

6. The whole of the urine should be collected into one

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* Because digestion, whose efficacy the urinoscopy determines, will then have had time to be completed in a normal person.

† The patient must have slept through the night.

single vessel lest anything should be spilt out of it ; one should allow it to settle before scrutinizing it.

7. The urinal must be clean. For instance, alkanna will impart its colour to the urine ; this is a dye used by some people for tinting their skin and finger-nails.

8. The vessel used for the specimen must be clean, and the previous sample must have been rinsed out of it.

9. The material of which the vessel is made should be clear white glass or crystal.

10. The urine must not be exposed to the sun or wind or freezing cold, until the sediment has separated out and the various characters have properly developed. The settling is not immediate even if the digestive processes are normal.

11. The sample must be inspected in a light place where the rays do not fall directly upon it, as otherwise the brilliant light would interfere with the colours and give rise to erroneous deductions.

12. The nearer one holds the sample to the eye, the denser does it appear. The further away it is, the clearer does it seem. In this way one can distinguish urine from other fluids brought to the doctor in a falsified state.

604. There is little advantage to be derived from the study of the urine in childhood, and still less in infancy, because their nourishment consists solely of milk, and the very little colouring matter there is in the urine is lost to view ; their " nature " is also very feeble in view of the fact that they pass so much time in sleep, which abolishes the evidēnces of digestion.

605. The first and foremost object of observing the urine is to form an opinion about the state of the liver, the urinary passages and the blood-vessels. The various disorders of these organs are revealed by it. But the most precise information to be obtained is that concerning the functional capacity of the liver.

INSPECTION OF URINE. (TAFSIRA.)

The name " tafsira " is given to " inspection " because it " explains " (tufassir) and makes manifest to the physician ; it is an indication or guide (dalīl) to the patient's condition.*

606. The following are the points to observe in a sample of urine :

1. quantity (**665**)
2. odour (**645**)

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* Dict. of the Technical Terms used in the Sciences of the Mussulmans [118], and Browne [7], p. 142.

3. colour (**609**)
4. foam (**649**)
5. texture (**627**)
6. clearness (**632**)
7. sediment (**652**)

Some persons add other two : the feel and the taste, but we reject them as objectionable.

By *colour* we understand the various shades of colour perceived by the sense of sight—whiteness, darkness, intermediate shades.

By *texture* we refer to the coarseness or fineness.

By *clearness* or turbidity we refer to the ease or otherwise with which light traverses it (translucence).

607. There is a difference between texture and translucence, for a urine may be coarse and yet as clear as egg-white or liquid fish-glue ; and a rarefied urine may be turbid (e.g. turbid water is more rarefied than white of egg).

608. Turbidity depends on the presence of certain variously coloured particles—-opaque or dark, or tinted with other colours which are imperceptible to the sense of sight and yet are impervious. Sediment differs from turbidity in that the particles are readily visible to the eye, whereas particles cannot really be distinguished in the case of turbidity. Sediment appears immediately after the passage of the urine ; turbidity does not clear up on standing. Turbidity differs from coloration in that the latter pervades the whole substance of the urine, whereas turbidity is less intimately admixed.

2. The Significance of the Colour of the Urine

609. The degrees of yellowness. Among the shades of yellow colour are : (1) straw-yellow ; (2) lemon-yellow ;* (3) orange-yellow ; (4) flame-yellow, or saffron-yellow ; that is, a very deep yellow ; (5) clear reddish-yellow. All except the first two denote a hot intemperament, in degrees varying with the amount of exercise, pain, fasting, and abstinence from water. The fourth variety denotes predominance of the bilious humour.

[Variants of (1). If the urine is plentiful also, it shows that a crude humour is being excreted by the urine. If there is also a sediment which is white, smooth, equable and plentiful, it shows that the digestion is good. If thicker, and a sediment is present, it shows that the digestion is not altogether bad. If gritty, scaly, furfuraceous, with black, livid, green or fetid sediment, this shows entire lack of digestive function (Aegineta).]

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* Lemon-yellow (utruj).—Orange-yellow (naranja).—Reddish-yellow (shuqrat).—The latter is the yellowish colour of a chestnut horse.—Another yellow, with a reddish shade, is called jujube colour (unnabi) ; this is not in the text, though enumerated with dyers' colours (cf. Night 933).

610. II. THE DEGREES OF REDNESS. (1) rose-red or roseate; (2) very dark red; (3) purple red, which has a brilliance about it like a certain rose; (4) smoky red or dull red. All these denote dominance of the sanguineous humour, for dullness of colour points that way. A flame-yellow shows the presence of more "heat" than dull red because it shows there is bilious humour in it, and this is hotter than sanguineous humour.

The urine tends to saffron-yellow and flame-yellow in acute maladies described as "burning"; but if the urine is at all inclined to be clear, it shows a certain degree of "digestion," namely that this process has actually begun, but its products have not yet appeared in the substance of the urine.

611. Deepening of colour from lemon-yellowness towards a flame-yellow shade shows that the innate heat is steadily increasing. The colour then ceases to be yellow, and attains a pure clear red. If the urine now begins to clarify it shows that the (pathological) heat is beginning to subside.

In acute diseases of a haemorrhagic character, the urine may be tinged with blood without any evident rupture of blood-vessels having occurred. This would indicate an excessive plethora. A gradual loss of blood by the urine, associated with a bad odour, is a sign to be dreaded because it informs us that there is haemorrhage proceeding from congested parts. The prognosis is still worse if the urine becomes thinner and more offensive in odour.

612. Admixture of the urine with blood may be a good sign—namely in acute composite fevers—for it shows that crisis is about to take place, and recovery will follow. The only exception is if the urine becomes suddenly transparent (its colour becoming normal, i.e.) before the crisis is due. Such a phenomenon would be a forerunner of a relapse. But thin urine appearing before the crisis may be equally unfavourable unless the change has been gradual and progressive.

613. In jaundice, if the urine becomes of a deeper red until it is nearly black, and its stain on linen can no longer be removed, it is a good sign;—the better the deeper the red. But if the urine becomes white or slightly reddish, and the jaundice is not subsiding, the advent of dropsy is to be feared.

Fasting is among the conditions which render the urine high-coloured and of marked acridity.

614. III. THE DEGREES OF GREEN COLOUR. (1) A colour approaching that of pistachios* ; (2) the colour of verdigris ; (3) rainbow green ; (4) emerald green ; (5) leek-green. The first denotes a cold intemperament, as do all things the shade of whose green is not (2) or (5). These (2, 5) denote extreme combustion, but (5) is not as unhealthy as (2). If it should be met with after physical labour it denotes " spasm." A green-coloured urine in adolescence points to the same condition.

Rainbow green usually denotes an extremely cold intemperament. In this respect it comes next to (1). Some say that it shows that poison was present in the fluid taken as drink, and that if there be a sediment present there is a hope of recovery; if no sediment, death is likely to take place. Verdigris green colour of urine forewarns of death (destruction of innate heat).

615. IV. THE DEGREES OF BLACKNESS. (1) Dark urine approaching blackness, through a saffron colour. This occurs in jaundice, for instance. It denotes (*a*) denseness and oxidation of the bilious humour ; (*b*) atrabilious humour derived from bilious humour ; (*c*) jaundice. (2) Deep-brown-black. This shows the presence of sanguineous atrabilious humour. (3) Greenish-black. This shows the dominance of pure atrabilious humour.

(Speaking generally) dark or black urine denotes (*a*) extreme oxidation ; (*b*) great cold ; (*c*) extinction of the innate heat (i.e. death) ; (*d*) crisis ; (*e*) evacuation whereby the effete substances from the atrabilious humour are expelled.

616. (The details about each of these are :) (*a*) dark urine *due to extreme oxidation* is recognized by its causing scalding, and being previously yellow or red. The sediment is discrete (not coherent), not homogeneous, discontinuous, not very dark, but tending to a saffron, lemon-yellow, or dark brown. If the colour of the sediment tends to be lemon-yellow, it strongly suggests jaundice.

(*b*) When darkness of the urine is *due to great cold*, the urine would previously be tending to a green tint or a livid tint. The sediment is here slightly coherent, and looks dry, and is more purely black in colour. If a dark urine is also very offensive, it shows that the temperament is hot. If it be odourless, or has only a slight odour, it shows that the temperament is cold. This is because no odour emanates from urine unless the innate heat overrules the cold.

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* Cf. the passage in Night 933 : " I can dye various kinds of green, such as grass green, olive green, pistachio green, parrot green." (Burton, v. 483.)

(*c*) When darkness of urine is *due to extinction of the innate heat* this is recognized by the dispersion of vitality.

(*d*) When the darkness *arises from a critical change* in a fever ("critical polyuria") one of the following conditions may be supposed: the termination of a quartan fever; the resolution of a splenic disease; the termination of a fever associated with the atrabilious humour; the termination of a fever prevailing by night and by day; subsidence of pains in the back and womb; retained menses; retained blood in a case of piles—both the latter two occurring especially when nature is assisted by art. It occurs *in women* in whom the menses are retained, because the effete matters of the blood cannot be disposed of by nature. This is shown in the urine by its being watery previously. When the effete matters are finally discharged from the body, the urine at the same time becomes very abundant.

617. *Prognosis.* If at the critical periods the urine do not become dark, it is an ominous sign, especially in acute diseases, the more so if at the same time (*a*) the quantity of urine be small (for scanty urine is evidence that the humour has already become destroyed by oxidation); (*b*) the sediment be coarse-textured; the coarser, the more depraved; the finer, the less.

Dark urine is a good sign in acute diseases.

If the urine is limpid [as well as dark] and a deposit is suspended in it at different layers, this denotes cephalalgia, wakefulness, deafness, mental confusion. If the urine is secreted only by drops, and a sediment forms slowly, and the odour is pungent, and there is fever—all this would be strong evidence of the above. But when there is wakefulness, deafness, delirium, and headache—such urine would show that epistaxis is pending.

Dark or dull red urine which is passed after drinking wine of that colour or after taking certain medicines need cause no alarm. The wine has simply passed unchanged through the body.

Dark urine may be evidence of renal calculus. As Rufus says, "black urine is good in infirmities of the kidneys and in stone in the bladder, and also in maniacal cases, for they are diseases proceeding from gross humours. But it is a grave sign in acute diseases". On the other hand, he says that black urine is a bad sign in diseases of the kidneys and bladder if at the same time it is extremely scalding. Therefore one must take all such signs into consideration.

When dark urine occurs in aged persons, it is not a good sign because in such persons, as you know, it can only denote great destruction of tissue. In puerperal women, the appearance of dark urine is premonitory in convulsions.

In brief, the appearance of dark urine is serious at the onset of fevers as well as at their close, if there is neither crisis nor any abatement of symptoms at the same time.

618. WHITE URINE. The word "whiteness" is applied in two ways: mere translucence, as the laity calls anything which is translucent "white." Thus, clear glass, clear crystal, are "white." Translucence implies absence of all colour. Such urine is "thin" and translucent. Secondly, there is true whiteness, like that of milk or parchment. Such urine is not translucent.

Whiteness in the first sense shows that the intemperament is altogether a cold one, and that digestion is good. If the urine be at the same time coarse, it shows that the serous humour is abundant. A urine which is white in the second sense is necessarily coarse.

619.

Variety of Whiteness.	Significance.
(*a*) Mucilaginous.	Excess of serous humour, and crude humour.
(*b*) Waxlike.	Liquefaction of adipose tissue.
(*c*) Greasy, soapy.	Liquefaction of serous humour; or it may denote diabetes, active or latent.
(*d*) Musty whiteness:	
(i) Tinted with blood and pus.	Ulcers discharging into the urinary passages.
(ii) Not tinted with blood.	Great excess of crude non-matured matter; vesical calculus.
(*e*) Semen-like:	
(i) Critical in form.	Crisis in an inflammation arising in serous humour. Diseases associated with vitreous serous humour. Seminal emission.
(ii) Not critical in form and no inflammation.	Forewarns of apoplexy and palsy.
(iii) Continuous throughout a fever.	The fever will soon become quartan.
(*f*) Lead-white; no sediment.	Bad.
(*g*) Milk-white; in acute diseases.	Ominous.
(*h*) Previously coloured; in acute fevers.	This shows that bilious humour has descended to some member about to develop an inflammation (e.g., the abdomen, or, which is worse, the head).
(*i*) Sudden change from red to white in the course of a fever.	The patient will become delirious.
(*j*) Whiteness persisting in a person apparently healthy.	Absence of digestion (esp. in the venous system: Ch.M.[7]); and in diabetes.
(*k*) Whiteness like buttermilk, in acute fevers.	Fatal issue; or wasting.

620. When the intemperament is hot because of the dominance of the bilious humour, the urine may appear white [contrary to expectation]. When the intemperament is cold because of dominance of the serous humour, the urine may appear red [contrary to expectation]. If the bilious humour passes down the urinary passages without being admixed with the urine, the latter remains white. Hence it is necessary to study white urine with care. For, if its colour were brilliant, and if the deposit is plentiful and coarse, and the urine itself is rather thick, it shows that the whiteness arises from a cold intemperament, with predominance of the serous humour. Again, if the urine be not clear and bright, and there is not much deposit, and if the whiteness tends to a brownish tint, it shows that there is bilious humour concealed therein. Whiteness in the course of an acute disease, the signs of recovery being present, with no fear of maniacal delirium, and the like, indicates that the bilious humour has passed out by some other channel, such as the intestine, causing constipation.

Brilliant.—Arabic ; mushriq ; Latin : clarus.—This term describes the colour-effect produced in urine by the presence of bile-pigment (as shown by its use in the next paragraph, where it is evidently equivalent to our " dichroic "). Other equivalents are : bright, shining, refulgent, lustrous, luminous. In this passage Avicenna seeks to warn the reader that a urine is not necessarily free of " bilious humour " because it happens to be very pale (white).

Brilliance, however, may be taken as evidence of health, for when metabolism proceeds quite normally, the urine assumes a peculiar clear shining colour when viewed in the light. In this case, we may think of the various stages of catabolism proceeding without the formation of irregular intermediate substances, or by-products. The moments of nascence (§91) are " sharp " throughout.

621. If urine is red in the course of " cold " maladies, it means one of four things—(1) that there is severe pain which disperses the bilious humour (ex. : colic without the signs of inflammation) ; (2) there is so much serous humour in the bileducts as to give rise to obstruction there, and the bilious humour is in consequence diverted from the intestine into the urinary passages. (3) Hepatic insufficiency, especially in regard to separating off water from the blood, as occurs in " cold " dropsy. The urine comes to look like the washings of raw meat. (4) Some form of putrefactive process in the veins subsequent to obstruction in the ducts ; here the serous humour in the vessels undergoes a change of colour. The urine is rendered watery, and the sediment is of a kind already described—faint in colour, and not refulgent. The presence of bilious humour renders a colour refulgent (i.e. dichroic).

622. Urine is often white at the onset of a disease, and becomes dark and offensive in odour later. So it is in jaundice.

623. Urine becomes white after a meal, and remains so until digestion is nearly completed. It then begins to assume colour.

624. During the waking state, the urine is white—partly because of dispersal of the innate heat—but it is not refulgent. It tends to be dusky if there is an associated defective digestion.

625. *Prognosis.* A red colour is better than a watery-white one, in the case of acute diseases. But a white colour is better if intrinsic—not due to wateriness.

Redness due to blood is not as dangerous as redness due to bilious humour. Redness from bilious humour is not as serious if the bilious humour is quiescent ; it is very ominous if it begins to move about.

Red urine is very bad in the case of renal disease because it is a sign that there is a " hot " inflammatory process there. If it occurs in diseases associated with (intense) headache, it portends delirium.

When a urine begins to turn red in an acute disease, and stays so, without forming a sediment, it is an ominous sign because it points to an inflammatory swelling in the kidneys. If such urine becomes turbid, and stays so, it points to an inflammatory mass in the liver, with lack of innate heat.

Unusual coloration of the urine, produced by eating saffron or cassia fistula must be borne in mind ; tricksters may alter their urine thus (Alsaharavius).

So much for the simple colours of the urine.

626. THE COMPOUND COLOURS OF THE URINE.

(1) *Like raw meat washings* (i.e. blood-stained water). This means hepatic insufficiency due to plethora of blood or to any form of intemperament, resulting in deficient digestive power and dispersal of the vitality. Were the vital power adequate, it would show that there is plenty of blood, even to great excess ; and in such a case, the secretory power would be hardly adequate for dealing with it.

(2) *Oleaginous. Oily.* The fat of the body is being destroyed. The appearance is like a lemon-yellow tinged with the greenness of the mistletoe growing on larches. It is called oleaginous because it is viscid and translucent, and also has the lustre of fat, and shows a certain brilliance or refulgence in spite of a certain opacity. It is not a good sign in many states, not to say it is bad. For it shows there is neither maturation, nor a change for

the better. In rare cases it indicates the critical evacuation of unctuous matter, but for it to mean this alleviation must follow.

If such urine be also fetid and scanty in amount, it is a very ominous sign. It is also serious if it be admixed with material like meat washings, as might happen in the course of dropsy, phthisis, and intestinal obstruction.

If oleaginous urine replaces a black urine, it is a good sign. But if such a urine appear on the fourth day of an acute disease it forewarns of the patient's death on the seventh day. (Very dark oily urine forewarns of collapse and death. Theophilus.)

In brief, there are three kinds of oleaginous urine. (1) All fat, throughout. (2) Fat only in the lower part. (3) Fat in the upper layers. The first is oleaginous only in colour ; it occurs in phthisis, hectic fever, and wasting diseases, especially at their outset. The second is oleaginous only in "substance." The third is oily in both respects—e.g. in diseases of the kidney, at the acme and termination of phthisis.

(3) *Purple (-black).* This is a very bad sign. It means oxidation of both bilious and atrabilious humour.

(4) *Ruddy colour admixed with a tinge of blackness.* This occurs in composite fevers and in fevers arising from gross superfluities. If it clarifies, and the darkness settles down from the surface, it denotes an inflammatory mass in the lung.

3. THE SIGNS AFFORDED BY THE DENSITY, QUALITY, CLEARNESS OR TURBIDITY OF THE URINE

627. Urine may be transparent or opaque, or intermediate in density.

§ 237*a*. The "density" here spoken of is not the equivalent of "specific gravity," though many of the statements in the text would apply equally even in the modern sense.

The difference in specific gravity shown by the morning and evening urine (1005, 1015 respectively, for health) was not discernible with unaided senses, but the general rule still holds that a persistently dense urine (sp. gr. over 1022) indicates a need for depurative foods (greens, acid fruits).

TRANSPARENT (LIMPID) URINE

628. Whatever be the state, a urine of limpid consistence denotes : (*a*) deficient digestion (lack of maturation) ; (*b*) venous congestion ; (*c*) renal insufficiency (for the kidneys only separate out fine matter, or if they attract other matter, they fail to discharge it until it has been rarefied or rendered capable of excretion ; (*d*) excessive fluid-intake ; (*e*) a very cold or a dry intemperament.

When it occurs in the course of an acute illness, it denotes deficient digestive power, and inability to complete digestion (absence of maturation : cf. above). It may indicate that the weakness of the other faculties is so marked that they cannot influence water at all, and hence it passes through the body unchanged.

629. *Prognosis.* It is worse for urine to be very transparent at puberty than in adolescence, because during the former period of life urine is naturally more opaque than in adolescence. Being more moist in their temperament, their bodies attract moisture more readily, and, in addition, moisture is essential for their growth. Hence, if acute fevers arise during the age of puberty, the urine is decidedly abnormal if it is transparent ; and, should it continue of that character, it would be a very ominous sign. Should it continue and favourable symptoms should not appear, and should the vitality not be maintained, it would be a sign that an abscess is forming below the liver.

630. If urine continue to be transparent for a long time without any variation in a person otherwise healthy, should he experience pain one will know that an inflammatory mass is forming in the situation of the pain. The pain is usually lumbar when the urine is of this character, and that is the usual site for an abscess.

If there is no localized pain in such a case, but a general pain and heaviness, this points to the widespread formation of small pustules.

If the urine is transparent at the crisis of an illness, contrary to rule, it forewarns of a relapse.

OPAQUE (THICK) URINE

631. If the urine is very opaque, it shows that maturation has failed to take place ; or, more rarely, it denotes the maturation of " gross " humours, such as occur at the height (status) of humoral fevers, or after the opening of abscesses. In acute fevers, the appearance of opaque urine is usually a bad sign, though not as bad as a persistently transparent urine. The fact that urine is opaque shows that there is a certain degree of digestion proceeding, because digestion adds to the opacity of urine to a certain extent, and shows that there is some power of expulsion (of effete matter). But it is a bad sign in so far as it denotes the breakdown of, and abundance of, humours, and that the evacuation of the separated materials is hindered.

To ascertain which of the two is dominant, notice whether improvement or increased weakness follows.

Prognosis. When opaque urine is passed in the course of fevers, it is a less serious sign if it be poured out quickly and plentifully. When excreted slowly it denotes a redundance of the (serous, Ch.M.[7]) humours and an enfeebled vitality. A sign which is still less serious is that a urine of medium density should go with a simultaneous improvement in the general condition.

A very dense urine sometimes denotes that digestion is unduly excessive (Ch. M.[7]).

When the urine is transparent in an acute illness, and then becomes thick, and there is no improvement in the condition of the patient, it denotes colliquation [of tissues].

Persistent opacity of urine in a presumably healthy person forewarns of fever should headache and mental confusion arise. Opaque urine also occurs after excessive evacuations, after the opening of an abscess, or owing to ulcers in the urinary passages.

Transparent and opaque urine cannot both denote lack of digestion (maturation) unless there is an intermediate degree of density associated with the maturation. Dense substances are rendered thin or limpid by the process of digestion, and the urine changes from transparency to opacity.

CLEARNESS AND TURBIDITY

632. Thick urine, as has been already stated, is sometimes clear and translucent, sometimes turbid and opaque; and yet there is a marked difference between thick and limpid translucent urine. When the former is shaken, it does not easily break up into little portions—it only forms large portions; and the particles move slowly; and if it makes a foam, its foam is composed of numerous bubbles which do not coalesce for a long time. Such a urine is the outcome of an adequate digestion of the serous humour, or of the vitelline bilious humour (if there be any tint suggestive of yellowness in it); or of the resolution of vitreous serous humour (if there be not any tint of yellowness in it). The last-named variety is often found in the urine of epileptics.

But a well-coloured transparent urine owes its colour not to digestion but to admixture with bilious humour. For otherwise digestion would be supposed to affect only the "substance" until a mixture of colours had been brought about, whereas the process of digestion effects a change of "substance" first, and of colour secondarily. Digestion concerns "substance," not "colour." Hence if a transparent urine is yellow, and there is no abatement of the acute illness, that is a bad sign, for it shows the digestive faculties are dormant.

The appearance of alternating redness and yellowness in a limpid urine points to inflammatory changes dependent on toil. If it be limpid and shows scale-like objects in it, and if the bladder is healthy, that is a sign of oxidation of the serous humour.

In brief, a thick urine in acute febrile states may denote predominance of various humours, and at the same time point to colliquative processes (in the body). Should such processes persist during the whole phase of a disease, the urine would become more opaque (denser, thicker).

Lastly, *turbid urine* denotes earthiness as well as the presence of gas and wateriness. For when these qualities are combined, turbidity is the result. When they are separated again, the urine becomes clear.

633. *The following three states should be noted*

1. The urine is clear at the time of passing, and then becomes opaque. This shows that maturation is difficult ; that the matter (of the food) has not yet succumbed to the vegetative powers (" nature "). It may denote colliquation in the tissues.

2. The urine is opaque when passed, but then becomes clear. The coarse matters settle and separate out. This shows that the vegetative powers (" nature ") have already overcome the material (of the food) and matured it. The clearer it grows, the greater the amount of sediment, and the more rapidly the sediment falls, the more complete is the digestion.

3. A state between the above two. In this case the vegetative powers improve, as long as the vitality is maintained. It shows that maturation is not progressing to completion. But if the vitality is not maintained, it would mean that the maturative processes are not likely to reach completion. Should this condition persist a long time without the feared symptoms (of loss of vitality) appearing, then it is likely that headache will develop, for it shows that there is much gas formation.

In modern language we should say :—

Urine which is clear when passed, but is turbid on standing ; if acid, the deposit is (*a*) urates, which are not soluble in the cold ; or (*b*) bacterial decomposition, stellar and triple phosphates separating out.—We should heat the specimen also ; a cloud in an acid urine would be albumen.

Urine which is turbid when passed or becomes turbid on standing ; if alkaline, the deposit is earthy phosphates (magnesium and calcium). It is met with after a rich protein meal or vegetable meal. Such a urine may become cloudy on heating, from the deposition of (calcium) phosphates, which are soluble again if acetic acid be added.

It is a better sign for a clear urine to become turbid than for it to remain turbid for several hours after being passed.

Urine may become turbid because of loss of vitality, apart from expulsion of "the nature."

If urine is watery when voided, and remains so, it shows that digestion has entirely ceased.

634. *Good signs*

(*a*) Opaque urine easily voided, whose sediment falls easily: when occurring in palsy, etc.

(*b*) Urine opaque when voided but then becoming transparent and plentiful.

(*c*) Limpid plentiful urine following upon thick turbid urine or thick and scanty urine.

(*d*) Opaque turbid urine passed at a slow rate, and then becoming suddenly abundant and easy to void. (This means that recovery is about to take place, whether it be an acute fever or any other plethoric disorder, or a plethora about to manifest as actual disease). But this kind of urine is rarely met with.

635. If the urine is of natural colour, and its opacity be great, it is evident that much (effete) matter is passing through, and that there is no hindrance to their outflow. But it is usually a bad sign because it shows that the humours are superabundant, and the vitality deficient. Such a urine is scanty and difficult to void.

Opaque urine is a good sign if it occurs at the crisis in "splenic" diseases and "mixed" fevers, in which the emunctory powers cannot come into play, or equipoise be restored.

Lastly, turbid urine denotes that the humours are overabundant and that the vegetative powers are inadequate for their digestion.

636. *Diagnostic points.* Opaque urine, with a sandy sediment, denotes calculus. Opaque urine, with pus, a bad odour, and scaly particles separating out, denotes rupture of an abscess. A thick urine, with the clinical evidences of an inflammatory mass or of an ulcer in the bladder, kidney, liver or chest, shows that there is an abscess about to burst.

If the urine prior to that were like the washings of raw meat, it would show that there is unhealthy blood flowing from the liver; and if the faeces were also similar, it would show there is an inflammatory mass in the interior of the liver. If prior to this there was shortness of breath, with a dry cough, and a stabbing pain in the chest, then one knows that an abscess has ruptured which arose in the chest or (round the) aorta. If the pus is " mature," it is satisfactory.

637. Discharge of urine resembling pus may benefit a person who takes no exercise and lives in an unhygienic manner. It clears the whole body, and removes the laxity resulting from the lack of exercise. It may be that there are obstructions in the liver and adnexa, and when the obstructions are removed, the urine which is voided is dense owing to the matter which passes out with it. Such " matter " is not " pus." It is only pus if it appears in the urine after the bursting of an abscess ; the urine is then not only thick but dark. If at this time there be pain in the left side, then one knows that the abscess was in the spleen. If the pain is in the upper part of the abdomen, one knows the abscess was in the stomach. The usual site for the abscess is in the liver and in the urinary organs.

638. Turbid urine often denotes loss of vitality ; coldness dominates in the temperament as much as if the whole body were exposed to external cold.

639. Turbid urine of the appearance of poor wine, or of chick-pea-water, may occur during pregnancy, and may be met with in persons with long-standing internal " hot " inflammatory masses.

640. Urine which has the extremely turbid appearance of asses' urine or the urine of other cattle, arises from the very marked agitation which is going on in the humours, especially the serous humour, a certain amount of heat coming into play so as to set up that agitation. Hence this kind of urine is a forerunner of headache or [coryzal] catarrh in the head. If it persists, it forewarns of lethargia.

641. If the urine resembles the colour of some member for some time, it forewarns that disease is about to arise there.

642. Some say that if the lower layers of the urine show a powdery or nebulous appearance, it means that the illness will be of long duration ; and that if it persists throughout the whole illness, it presages death, or the formation of " crude " serous humour, which is distinguished from pus by its fetor.

643. If the urine separates into several layers, the more there are the stronger is the natural faculty, and the more open are the pores.

644. *Threads floating* in the urine denote that it was passed immediately after completing coitus.

4. THE SIGNS DERIVED FROM THE ODOUR OF THE URINE

645. Some people assert that no sick person ever passes a urine which has a healthy odour. But we say that if the urine is quite odourless, it denotes (*a*) a cold intemperament ; (*b*) excessive "crudity" ; (*c*) extinction of the innate heat, in the case of acute diseases.

646. *Fetid odour*. A fetid odour, with signs of maturation in the urine indicates ulcers in the urinary passages, or "scabies." These are identified from their own signs. If with the fetid odour, there are no signs of maturation, the cause of the odour may be merely putrefaction.

Such a urine, in acute fevers, without disease in the urinary organs, is a bad sign. If it is present in acute fevers, and there is a tendency to acridity, it denotes putrefaction in humours which are of a cold nature, when there is a predominance of the extraneous heat.

If such a urine appears in acute diseases, it forewarns of death by extinction of the innate heat and predominance of the extraneous cold.

647. *Sweetish odour*. This denotes predominance of the sanguineous humour. If also very fetid, a predominance of the bilious humour.

648. *Putrid odour*. If this tends to sourness it shows predominance of the atrabilious humour.

An extremely fetid odour of the urine which continues in spite of seeming health denotes (*a*) that a fever arising from putrefaction is coming on ; (*b*) expulsion of retained putrescent matters. The latter will show whether the case may be expected to recover. If a fetid urine appears in an acute illness, and then suddenly ceases to be fetid, without subsidence of the symptoms, it shows a destruction of vitality.

A moderately fetid urine denotes defective digestion : Haly Abbas.

Offensive odour may be ammoniacal, as in alkaline fermentation. Sweet odour may be "fruity" or like new-mown hay in diabetes. Specific odours result from the use of certain drugs. (Modern.)

5. THE INDICATIONS AFFORDED BY THE FOAM ON URINE

649. Foam arises from the moisture and the gases forced into the urine as it is passed into the urinal. The vapour which leaves the body with the urine doubtless adds to the consistence of the urine, especially if gases predominate in it, as occurs in cases of obstructions. The urine then shows many bubbles.

650. One notices the following points in regard to the foam:

(1) Colour: it is dark or reddish in jaundice.

(2) Size of bubbles: large ones indicate viscidity.

(3) Number of bubbles: if numerous it denotes viscidity and much gas.

(4) Rate of bursting of the bubbles: if slow, it indicates viscidity, and coarse glutinous humour.

651. *Prognosis.* Hence if small bubbles persist in a specimen, in cases of kidney disease, it shows that the illness will be of long duration.

In brief, viscous humours in the course of kidney diseases are of bad omen; they show that the humours are depraved, and cold in temperament.

The significance of small bubbles has already been stated.

6. The Indications derived from the Divers Kinds of Sediment

652. *Definition.* In the first place one must specify the meaning of the term "sediment." It is not "that which sinks to the bottom of the vessel." It is "that whole substance (denser in essence than wateriness) which separates out from the wateriness—regardless of whether it settles down or not, floats or not, sinks or not."

Therefore we may say that there are various characters pertaining to the sediment—its "structure," its quantity and quality, the arrangement of its components, its position, duration, and mode of permixture.

I. STRUCTURE

[Structure; consistence; texture; essential substance; matter; jawhar.]

A. NATURAL SEDIMENTS

653. A sediment is natural, laudable, evidence of normal digestion and maturation, when it is white, sinks to the bottom of the vessel, when its particles are in continuity [i.e. not discrete], uniform, and all alike. In contour it is rounded. It is light, homogeneous, delicate, like the deposit which forms in rosewater.

Its relation to the maturation of the various matters of the whole body is comparable to that to the maturation of pus. But whereas it is white, light, and of homogeneous nature and delicate in the former, in the case of pus it is coarse.

654. A sediment betokens good digestion even though devoid of colour and homogeneity.* But ancient physicians considered that homogeneity was a more important test than colour. A homogeneous deposit—even though not altogether white, or even if reddish in tint—is a better sign than a deposit which is white but not homogeneous, and composed of coarse particles. The sediment may or may not assume the same colour as the urine. If it does not, it is better that it should be white, next best red, then lemon-yellow or saffron-yellow, and the least good is that it should be like arsenicum in colour, or of a colour like that of lentils.

However, I counsel you not to regard what others say. I say that—whiteness does not necessarily have a relation to the state of digestion ; homogeneity is always related to the (efficiency of) maturation. A thorough mingling of gaseous constituents will produce a white effect.

If a sediment presents an unhealthy appearance, it is more favourable that it should be discrete than continuous.

655. Good sediments resemble pus and crude serous humour when they are tenuous. But pus is different in possessing fetor, crude serous humour is different in (rendering the deposit) compact and not homogeneous. A good sediment differs from both because it is finely textured and light.

656. One would not expect to find such a deposit in a person who is healthy ; it occurs in the sick person because matters are kept back in his blood-vessels, and they undergo (putrefactive) breakdown if they cannot be subjected to maturation. In health, the blood need not necessarily contain a humour which ought to be removed, but if there were such a humour present, it would be better if it were disposed of by way of the faeces (the indigestible excess in the aliments) than if it emerge by way of the urine as a sediment—whether such humour have undergone maturation or not.

In thin persons, the sediment of the urine is scanty and it sinks down differently according to the state of health, especially if the persons are accustomed to exercise or to practise laborious arts.

The sediment is abundant only in obese persons and in those of bad habits.

657. Hence one does not expect to find as much sediment in sick persons who are lean as in those who are stout. For disease in the former often resolves without any sediment forming at all. At most there may be a tiny particle floating or swimming in it. In other cases the sediment falls immediately after micturition unless there is good maturation—in which case very little deposit is to be expected.

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* The general significance of a sediment is that there is an excess of soluble or insoluble toxic substances in the blood.

B. ABNORMAL SEDIMENTS

658. *Varieties.* (1) Flaky or squamous ; (2) fleshy ; (3) fatty; (4) mucoid or slimy; (5) purulent (ichorous); (6) hair-like; (7) resembling pieces of yeast infused in water ; (8) sandy or gritty ; (9) cineritial ; (10) hirudiniform.

1. *Flaky or squamous.* This is composed of large red or large white particles. They are usually supposed to come from the urinary organs. If white, they come from the bladder (ulceration, desquamation, erosions) ; if red or fleshy, they come from the kidney. If brown or dark coloured, or like the scales of fishes, they are a very bad sign, worse than all which we have named. They suggest the shedding of mucous linings. Particles from the bladder or kidneys may not be of moment ; in fact, if vesical they are a sign of recovery. Some say that cantharides causes white flakes to appear, which are like the membrane within eggs ; these dissolve when the specimen is shaken and impart a reddish tint to the urine. This would be evidence of healing and recovery.

Another form resembles the scrapings from intestines ; the particles being less broad and of dense consistence. If reddish coloured it is called orobeal [or tare-like or grumous] sediment ; otherwise it is called furfuraceous. The former recalls the appearance of decorticated orobs [ervum ervilia], and are reddish ; this indicates the presence of oxidized particles* which are derived from (*a*) the liver, (*b*) the kidney, or (*c*) blood. When they come from the kidney, the particles are more continuous and fleshy, whereas in the other cases they are more friable. When the colour is decidedly yellowish (one knows that) they are of renal origin ; if dusky red (that) they are of hepatic origin. But sometimes particles of hepatic origin may resemble those of renal origin.

Another form, more strictly scaly, consists of small bodies like the husks or hulls of grain. Such a sediment denotes (i) bladder trouble, or (ii) grave colliquative disorder of the system as a whole. We diagnose (i) bladder trouble if (1) there is itching at the root of the penis, and (2) the urine is fetid, especially if (3) pus is passed first. Such a state is more probable if (4) there are other evidences of maturation in the urine, (5) if the veins over the bladder are healthy, and there is no macula there. We diagnose (ii) liquefaction of humour if there is fever, weakness, difficulty of micturition, and the sediment is brownish in colour.

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* The mineral constituents which are attached to the organic substances in the urine are (1) perfectly oxidized, (2) partly oxidized and partly unoxidized, (3) entirely unoxidized.

Another form, in which the deposit is like coarse particles of barley flour may mean one of four things : (1) oxidation of the sanguineous humour—if there is a tendency to redness ; (ii) colliquative changes in the membranes and their components —if it be white ; (iii) local bladder disease—in a few cases. The difference between this and the others is readily made out from what has already been said ; (iv) oxidation of the blood, especially in the spleen.—Here the colour tends to be black.

Squamous deposits other than those of vesical or renal and ureteral origin, occurring in acute diseases, have a grave significance.

2. *Fleshy sediments.* These, as you already know, are usually of renal origin. They are not so if the flesh is healthy and there is no breakdown in the body. If the evidences of complete digestion are present in the urine, it shows that the blood-vessels are healthy. For the urine can show evidence of maturation even if the kidneys are diseased, seeing that this process begins " above " the kidneys.

3. *Fatty sediment.* This, like the preceding, denotes colliquative processes in the body. It is more serious if it resembles " gold water " in appearance. There are two chief types—either it is abundant and discrete (this being derived from the renal fat) ; or scanty and admixed (this being derived from the fat of a more distant place). There is no fever, in the former case.

A white particle like a pomegranate seed may be seen in the urine. This will be derived from the renal fat. It denotes that a sanious ulcer has formed, especially in the urethra, especially if the sediment sinks promptly. (" In ardent fevers, it forewarns of death." Hippocrates.)

4. *Mucoid sediment.* This denotes an unnatural humour, which is too plentiful within the body and passes out either by the urinary tract, or a critical hip-gout, or joint pains. The distinction between them is made by the symptoms—whether they abate or not.

A dense humour may become rarefied and tenuous, and a laudable sediment results. Therefore in the course of acute disease, one must not depend on a laudable sediment appearing before the time when maturation (of the disease) is due, or before its signs have appeared. It may denote that there is a very cold intemperament of the kidneys.—(A very mucoid and abundant sediment appearing at the end of an attack of gout or arthritis, is a good sign).

5. *Ichorous sediment.* This differs from a crude sediment in being fetid. It is preceded by the evidences of abscess. Its particles easily aggregate and separate again. It may be very thoroughly mingled with the water ; it may separate out quickly from the water. A crude sediment, however, is both turbid and thick. It does not readily aggregate, nor separate easily. The urine is not fetid. The signs of abscess do not precede.

6. *Hair-like sediment.* This is produced by the coagulation of any internal humour, which has been exposed to the innate heat on its way from the kidney to the bladder. It is sometimes white, sometimes red. It clots in the kidney. The clots may be as long as the palm of the hand.

7. A sediment having the *appearance of yeast soaked in water*, is evidence of gastric and intestinal weakness and of depraved digestion (often due to milk and cheese having been taken).

8. *Sandy or gritty sediment* (" *Gravel* "). This is always a sign of calculus whether in process of formation or actually formed, or in process of solution. If red coloured, it shows it comes from the kidneys ; if white, it shows the origin is in the bladder.

A gritty sediment, where there are large particles like those of ground grain, is a bad sign in fevers (Hippocrates).

9. *Cineritial sediment.* This is a sign that serous humour or pus has altered in colour through long stagnation and breaking up of its particles. It may be that it is due to having undergone oxidation.

10. *Hirudiniform.* The sediment is of the (appearance and) colour of leeches. If well mingled with the urine, this denotes hepatic insufficiency. If less closely intermingled with the urine, it denotes a trauma in the urinary passages which breaks their continuity. If discrete, it shows that the lesion is in the bladder or in the penis. This subject is carefully dealt with in the third volume, under the heading of " haematuria."

The appearance of bodies like red leeches in the urine, associated with evidences of disease in the spleen, denotes a destructive disease in that organ. (It would seem that strings of blood clot are here referred to, in which case nowadays we should think of a villous tumour in the bladder. Tr.)

Note, that in diseases of the bladder, there is generally not much bleeding because the blood-vessels are few in number, are slender, and are deeply situated in its wall.

II. QUANTITY OF SEDIMENT

659. According as the sediment is abundant or scanty so the degree of the efficient cause is great or small. This has been explained under the previous heading. (It is more abundant in gross-living persons than in those who are temperate. It is less abundant in active persons than in those leading a sedentary life ; hence it is liable to be more abundant in females than males, children than adults.)

III. QUALITY OF SEDIMENT. COLOUR. ODOUR

660. *Black sediment* : this is a bad sign, as in the degree already shown in **617** ; but it is not so bad if the supernatant fluid is not black. (Haly Abbas says it is a fatal sign if it comes on after being intensely red.)

Red sediment. This shows dominance of sanguineous humour (sanguineous plethora) ; it occurs in fasting ; and when digestion is imperfect. If it continues to be present for a long time it denotes inflammation of the liver.

Yellow : this denotes great heat, because it is produced by bilious humour. It may also show an insidious disease.

Green colour : this has the same significance as black sediment.

White colour : this is sometimes good, sometimes bad. That is, when it is mucoid, ichorous, or foamy ; because this shows that the urine is not a completed secretion.

Odour. The indications from the odour have already been given in describing the other characters.

IV. CONSTITUTION, COHERENCE AND CONSISTENCE OF PARTICLES

661. Softness and homogeneity of the sediment which is otherwise laudable is more healthy than when met with in a urine otherwise not laudable. Discreteness of particles points to flatulence and impaired digestion.

V. POSITION

662. A laudable sediment may swim like a cloud or nubecula ; may float on the surface ; or be suspended in the middle layers (which shows that maturation has proceeded further than in the first variety.) If it is rugose or fimbriate and tends to sink, it is better; if it sinks to the bottom it is a sign of still more advanced maturation.

When the sediment is not laudable—it is more satisfactory when it is light and rises to the upper layers; or, if in the course of an acute fever, it is black; when the humour is serous or atrabilious, it is more satisfactory when it is like a cloud than for it to sink to the bottom; the fact of its being like a cloud shows it is tenuous, unless by chance gas is making it rise.

If the sediment sinks below the surface, but not right to the bottom it is more satisfactory. It is heat which makes it rise or float; or it is gas which carries it upwards.

If a sediment made of coarse discrete particles should float, it shows it is light. A fine sediment, especially if heavy, will sink lower.

If the sediment remains suspended as a nubecula right through an illness from its beginning, it shows that crisis will come with suppuration.

A nubecula or suspended sediment may never appear in an illness if the person be slender, as we have stated.

A sediment which is between a cloud and an enaeorema—made of particles suspended or floating in the middle layers like a spider's web (or opaque like a thin pancake—Rome edition) is an ominous sign. (Such particles may appear like the specks of oil which one sees in cooled broth; or like hairs.) But even a nubecula may be an anxiety, though it be the beginning of a change for the better. It sinks to the middle layers and ultimately to the bottom. In that case it is not a bad sign. But if a "bad" sediment appears after this, it is certainly ominous.

VI. TIME OCCUPIED IN SEDIMENTATION

663. If the sediment settles rapidly, it is a good sign, showing that maturation is correct. If it settles slowly, it is not good, for it shows deficient or absent maturation, according to its amount.

VII. FORM

664. The significance of this has been described in making mention of passing blood and fat with the urine.

7. Signs relative to the Daily Quantity of Urine

665. Generally speaking, oliguria means weakness of vitality. If the amount is less than the fluid consumed, it points to great loss by diarrhoea or to a tendency to dropsy. Polyuria sometimes means colliquation, and the discharge of fluid effete matters from the body by the urine.

To assess these correctly, one must note the state of the vitality, as follows: if the urine be of bad colour, it is a bad sign; but the more plentiful it is, the more likely is recovery to take place. If the quantity excreted fails, the illness will increase, just as applies in regard to dark or coarse urine.

666. *Variation of quantity.* It is a bad sign if the urine is at one time abundant, at another scanty, at another suppressed. It shows that there is a hard conflict between the vitality and the disease. A plentiful urine in an acute illness, occurring without any abatement of symptoms, and associated with copious sweats, shows hectic fever and may be followed by convulsions.

The quantity of night urine (9 p.m. to 7 a.m.) should equal that passed in two hours during the day. If greater, it denotes arterial disease (Comrie, B.M.J., 1922, p. 1071). Vallery-Radot states that the day-urine is normally thrice the night urine.[141]

667. A scanty urine, passed involuntarily, drop-by-drop in acute diseases, indicates cerebral disease, affecting nerves and muscles.

If a fever subside and there are other signs of recovery, one may predict epistaxis. Otherwise delirium will ensue and death is likely.

When a person is in apparent health, if the amount of the urine is diminished and it is tenuous in character, and if that condition persists, and if there is a sense of heaviness and pain in the loins, this shows that there is a hard inflammatory swelling in the kidney.

668. When the urine is *increased* in a case of colic, this is a good sign, especially if it be white and easily voided.

8. Description of Normal Healthy Urine

669. The following are the *characters of healthy urine*: A medium consistence; a delicate tint, tending to straw-yellow; if there be any sediment it is white, light, homogeneous, and has a rounded contour; the odour should be moderate, neither offensive, nor altogether absent.

Some say that if a urine of this kind appear suddenly at the end of the acme of an illness, health will be restored the following day.

9. VARIATIONS ACCORDING TO AGE

670. *Infancy.* The urine tends to the characters of milk, considering the food and their moist temperament. Hence it is nearly colourless.

Childhood. The urine is thicker and coarser than in adolescents, and more turbid. This has already been mentioned.

Adolescence. The urine tends to igneity, and homogeneity.

Later life. The urine tends to be white and tenuous, but it may be coarse (" thick ") because of the effete matters which are now being evacuated to a greater extent by way of the urine.

Decrepit age. The urine is whiter and still more tenuous. A similar coarseness to that of the preceding may occur, but this is rare. If the urine becomes very thick, it intimates liability to develop calculus.

10. VARIATIONS ACCORDING TO SEX

671. *Women.* The urine is always thicker, whiter and less pellucid than in males. The reason is fourfold : In women there is feebleness of digestion ; abundance of effete matters ; width of emunctory channels ; material discharged by way of the uterus, which draws similar material down the urinary passages also.

Men. When the urine is shaken, it becomes turbid and the turbidity ascends to the surface, though occasionally it remains throughout the whole bulk of the urine. When the urine in women is shaken, it does not become turbid because the particles are barely discrete, and there is usually a circular foam on top. Even if such urine becomes turbid, it does so only to a light extent.

If male and female urine be mingled, a filamentous network forms at once. (Filaments also appear in male urine if passed immediately after intercourse.)

672. *Pregnancy.* The urine is clear and there is a surface cloud. The colour may approach that of chick-pea water, or be yellow with a bluish or iridescent tint in it. In either case there is a sort of " tinted cotton " in the midst of it. Occasionally there are granules present, which rise and fall. If the iridescence (" rainbow tint ") be quite distinct, it is a sign that conception is beginning. When it gives place to redness, it shows that impregnation is completed, especially if the urine becomes turbid on being shaken.

Puerperium. The urine is often dark, as if there were a sootiness or shoemaker's black in it.

11. The Urine of Animals and its Difference from Human Urine

673. It is often desirable for a doctor to know something about the urine of animals, so that when he is tricked by a patient, he can quickly and truly discern it, difficult though it be to do so.

Asses. Some say that the urine is like clarified butter as to turbidity and coarseness.

Beasts of burden. The urine is similar to the preceding, but clearer. The upper middle part of the urine is clear, while the lower middle part is turbid.

Sheep. The urine is (nearly) colourless, with a yellowish tendency approximating that of man. But it has either no " body " and the sediment is fatty, or it is like oil-lees.

The better the quality of the food, the clearer is the urine.

She-goats. The urine is like human and sheep urine, but it has no " body," or sediment ; and is clearer than sheep urine.

12. Fluids resembling Urine, and how to Distinguish Them

674. Acetous syrup and all fluids compounded of water and honey, water and figs ; fluids coloured with saffron and the like—in all these the nearer one holds them to the eye the clearer do them seem, and the further they are held from the eye, the more opaque do they become. Urine is the opposite.

The foam on hydromel is yellow.

The sediment from fig-water or from herbal decoctions lodges on the sides of the glass and not in the middle. It has no definite contour, and does not move its position.

So much suffices for the description of the states of the urine. The individual varieties are discussed in the volume which deals with the special diseases. (Book IV.)

§ 238. TABULAR SUMMARY OF THE PRECEDING SECTION.

	Aspect, etc.	Colour.	Deposit.
1. First stage of Digestion.			
Good.	Urine plentiful, rather opaque.	White.	Homogeneous.
Moderately good.	Mod. fetor.		Round contour, red.
Absent.	Watery, limpid.	Pale; or yellowish (bil. hum.).	Gritty, scaly, black, green, or livid.
Excessive.	Very thick.		
2. Maturation stage:			
Normal	Opaque first, then clear.	White.	White, homogeneous, delicate, sinks to bottom.
Difficult.	Clear first, then opaque.	Tends to be dusky.	Discrete particles, sinks slowly.
Quite absent.	Opaque.		
3. Completed.	Clear; denser.	Colour appears.	Rapid, proportional to completeness of digestion.
Digestion of Humours.			
1. Immaturity in general.	Turbid.		Mucoid.
2. Serous humour.	Opaque or dense Foam persists.		
3. Vitreous serous humour.	Plentiful.	White.	Powdery, compact, not homogeneous.
4. Vitelline bilious humour.	Dense.	Foam persists yellow.	
Oxidation of Humours.			
1. Sanguineous.		Tends to red.	Coarse particles like barley flour.
2. Serous.	Limpid.	Mucoid.	Scale-like bodies float in it; cineritial.
Gross humours maturing.	Thick, opaque.		
Cold humours putrefying.	Offensive odour.		
Fasting State.	Very acrid.	High.	Red.
Intemperaments.			
1. Hot.	Dark. Offensive.	White, if heat due to dominance of bilious humour.	
2. Cold.	White, turbid, limpid.	Red if serous humour is obstructing bile ducts.	
	No odour.	Other colours.	
3. Dry.	Limpid.		

Vitality :—	
Deficient, because of cold intemperament.	Turbid.
Weak.	Oliguria.
Innate heat too great.	Colour deepens to red-yellow. Odoriferous.
Innate heat increasing.	Colour deepens to flame yellow.
Innate heat subsiding.	The urine clarifies.
Innate heat extinguished.	Urine dark or black; in acute diseases it becomes colourless.
Functional activity of Organs.	
Liver-inflammation.	Turbid, red urine; sediment orobeal or tare-like, or dusky red, or hirudiniform.
Splenic disease.	Sediment hirudiniform.
Renal inflammation.	Red urine; no deposit if grave; otherwise orobeal, or fleshy, and yellowish.
Venous congestion.	Limpid urine.
Stone in bladder.	Dark.
Special diseases :	
Obesity.	Urine abundant.
Puerperal convulsions.	Urine dark.
Fevers just before crisis.	Urine may become thin and transparent.
Fevers at other times, etc.	Opaque urine: depends on which humour is responsible and outcome of illness.
At the crisis.	Polyuria; dark, or black.

Corresponding table from a modern textbook. (J. K. Watson, p. 156.)

Disease.	Quantity.	Colour.	Odour.	Deposit.	Additional Modern Facts.
Acute Gout	Diminished	High		Urates abundant	
Acute Nephritis	Diminished or absent	Blood-stained		Blood casts urates occ.	Urea diminished Albumin
Chronic Cystitis	No change	Turbid	Offensive	Mucoid pus	Alkaline
Chronic Nephritis	Increased	Pale		Scanty	Albumin varies Tube-casts
Diabetes mell.	Increased	Pale	Sweet		Urea incr. Glucose Diacetic acid
Fevers, general and special	Diminished	High Turbid		Urates	Urea incr. Albumin, blood, tube-casts
Gastric Catarrh	Normal	High		Urates Oxalates or Phosphates	
Heart and Lung Disease	Diminished	Dark		Urates	Albumin
Jaundice	Normal	Frothy Greenish-brown		Varies	Bile present

§ 239. *Considerations arising out of this section.*—For the detection of changes in the composition of the urine, the ancients were restricted to the evidence afforded by its colour, odour, and what may be called its " texture " (though this term applies usually to solid substances). The evidence was apt to be fallacious because wide differences of composition may produce similar appearances, etc., and differences of appearance do not always denote noteworthy changes of composition.

On the other hand, the limitations in the utility of these simple observations were balanced by the relatively vague conception of the bodily functions. The whole outlook on disease was lacking in detail without being basically incorrect. Thus, many diseased states were ascribed to defective digestive processes, a fact often overlooked to-day in the counter-attraction afforded by the study of diseased conditions which are not so ascribable. To say that the whole body is concerned in digestion is, broadly speaking, correct, especially if we realize that the term digestion covers what we call metabolism. In the Canon, digestion is viewed in two aspects : (1) that which begins in the alimentary canal and ends in the liver : (2) that which is called " maturation," which concerns the digestive products in their course through the body and ending in the tissues. If such maturation is not completed, surplus substances appear, and may undergo sedimentation. The phenomena of disease are attributable to this defective maturation. Consequently, the business of diagnosis and prognosis comes to be a matter of assessing the efficiency or otherwise of maturation.

The study of the urine is therefore directed to this assessment, its different physical properties being noted, both in health and under various unhealthy conditions. Translucence, opacity, separation out into visibility of various substances, the appearance of gaseous matter (in foam), and changes in odour—all these are interpreted in the light of the two-fold division of digestion above referred to : that culminating in the liver, and that culminating in the tissues.

This basis of study is reasonable, and it is not right that they should have been superseded as is the case in modern times. We are armed with a knowledge of innumerable chemical details about the substances met with in metabolism and nutrition in general. We have within our reach the very answers, in vastly improved detail and accuracy, to the selfsame questions which were paramount to Avicenna. But this technical laboratory knowledge tends to be sterile. Urinalysis informs us of the presence of abnormal substances, and of the amount both of these and of normal urinary constituents. By their means we reach conclusions about the functional capacity of various organs, and decide whether organic renal disease is present or not. But this is insufficient. In the first place, these organs belong really only to one system—the nutritive; and in the second place, the illness has proceeded to another phase before the information from the analysis is available.

Moreover, the clinician has already taken up his tale before the laboratory work can possibly reach completion, so that those whom he instructs naturally receive the impression that such work is parenthetical, if not purely ritualistic. The clinical aspect of the case is discussed on its own merits, as might be done with a museum specimen which is possibly unusual, or with some topic for a connoisseur. The pathological aspect of the case, again, has a different, and separate interest.

It is not enough to combine these different aspects. Functional activities, morbid states, and clinical manifestations must *centralise in the patient*, and they do so, not because he happens to exhibit them all, but because they are one unity—himself. The organs whose capacity has been assessed are the gateways of entrance and departure; the crafts of the body—its real life—proceed in the tissues, which are the analogues of streets, houses, shops, plazas and bazaars. There are also the gateways of the senses, and these are direct routes into the audience-chamber of the presiding sultan himself. But he is not a separate being. He is *in* every member of the community—organs, tissues, sense-organs. Equity reigns throughout, and must be considered as much as the invaders of his domain.

So if we visualize in a practical form everything that is relevant, we must not forget the dynamic aspect of the matter. Changes are going on hour by hour, and the laboratory cannot keep pace with them. Consequently, we shall in the end make use of the selfsame data which Avicenna relied on entirely, and we learn from him to scrutinize the urine—not merely to find such things as albumen, blood or pus and casts—but deliberately to know :(1) Is there any insufficiency in the digestive processes in the pre-hepatic stages? (2) If not, is there any hepatic insufficiency, and in what direction? (3) If so, or if there is trouble in the tissues at large, arising out of an abnormal condition of one or more of the "humours"—which is at fault? In what way is it at fault? Is it entirely morbid or not? What degree as well as kind of defect is there—in modern chemical terms? (4) What is the degree of vitality of the patient (Avicenna included "innate heat" in this)? is the vitality increasing, or failing, or inactive?—recovery from illness, or its duration, or succumbing to illness is often primarily a matter of vitality. (5) Other questions.

Such fundamental questions the modern practitioner (even in cities) can still answer from the simple data used of old, and combine them with the intimate study of the pulse, to realize the nature of the processes in the organs and tissues of the sick from day to day, and feel himself actually armed with that *real* insight into the state of the particular patient which relatives and friends sometimes incorrectly assume him to have.

Changes in the urine were further studied in those days to decide on the presence or absence of inflammatory states in general, on febrile conditions in general, and to draw a relationship between these changes and certain symptoms, such as headache, pains in various parts of the body, palsies. In such cases, the character of the urine reveals the nature of the pathological changes in the humours, out of which the disease has arisen.

THE ALVINE DISCHARGE

675. The following are the characters to note: the quantity; the consistence; the colour; the form or shape; and the time occupied in the passage of food through the bowel.

1. Quantity. If greater than the amount of food taken, the reason lies in abundance of humours; if smaller in amount, the reason lies in deficient amount of humours, or in a retention of the food in the caecum or colon (in which case, it is the first step to obstruction). The reason may also be that the expulsive power is insufficient.

2. Consistence. Moist excrement denotes defective digestion or obstruction of some form; weakness of the mesentery, so that it does not absorb sufficient water from the food; fluxion from the head; some constituent of the diet which causes the dejection to be moist. If the faecal matter is both moist and viscid, this shows that there is colliquation in the tissues. Fetor is then present. It usually denotes an excess of depraved and viscous humours; and the fetor is then very great. It may denote the presence of viscous and "hot" constituents in the food, with defective digestive power.

Frothy faecal matter indicates an admixture with flatulent vapours, or exposure to great (innate) heat.

Dry stool results from (*a*) severe toil; (*b*) dispersal of innate heat; (*c*) polyuria; (*d*) igneous heat; (*e*) dry aliments; (*f*) a long delay in the intestines—as will be explained in the appropriate chapter. When the faecal matter is both moist and hard, the dryness is due to (i) undue delay in the intestines due to moisture which cannot escape; (ii) lack of bile, which serves to help on the excrement.

If there has been no delay, and there is no evidence of moisture in the intestines, it shows that there is a continual dispersion of sanious and pungent effete matter from the liver into the intestine, until the latter has taken it all up.

3. Colour. The normal colour is ruddy, owing to the presence of a slight fieriness. If this colour is more marked, it shows that the bile is plentiful. If less marked it indicates defective maturation of the food.

White stool points to obstruction in the biliary passages, and goes with jaundice. If there is also offensive sanious material present it shows that an inflammatory mass has ruptured.

A healthy person who does not take exercise often passes a morbid sanious matter which acts as a purgative and produces a satisfactory evacuation. For by this means laxity of the tissues is avoided (tarahhul, the swelling of the flesh, in horses), which lack of exercise is liable to produce, as we have already explained when speaking of the urine.

Unduly red colour of stool at the acme of a disease often denotes maturation; it often points to a depraved constitution.

The significations of *dark-coloured or black* stool are similar to those of dark or black urine. It means (*a*) marked oxidation; (*b*) maturation of a disease due to atrabilious humour; (*c*) an aliment which colours it; (*d*) a medicament which procures the discharge of the atrabilious humour. The first is unfavourable; the second is merely a staining from admixture with black bile; this cannot be clearly discerned from colour alone, but only by its acridity, bitterness and the churning out of earthy matter from it. Moreover, among its peculiar properties is this,—that it glitters (is self-luminous). The fact of black bile leaving the body, whether it be by the stool or by the vomit, is a bad sign.

Finally, the discharge of pure atrabilious humour per anum is usually a sign of impending death. But the exit of black chyme is beneficial because it shows that the tissues are active in oxidation, and their moisture is used up.

Blackness of stool also denotes admixture with blood, in cases of disease of the liver, intestinal ulcer, or rupture of vessels (Aegineta).

Green stool. This denotes extinction of the innate heat. The colour is due to the verdigris-green type of bile.

Dark-coloured or "livid" stool. This also denotes extinction of the innate heat; coldness; considerable mortification in the interior organs. It is a bad sign.

Parti-coloured stool. This is a bad sign. Reference to this is made in Book IV.

Fatty stool. This is met with when the fat of the body is being dissolved out.

Glutinous stool. In this case other tissues as well as the fatty tissue are being liquefied. It is a very grave sign.

Purulent stool. The pus comes from the liver, or stomach, or bowel.

Intensely yellow stool; when occurring at the beginning of a disease it is due to bilious humour. If at the acme, it is useful in that it purges the body (of undesirable substances).

Unusual colours in the stool, and the various colours which have a bad significance are spoken of in the special volume.

4. Form or shape. If the faeces are bulky like those of a cow it is because of flatulence, or gaseousness.

5. Time occupied in passage through the bowel. When the faeces are passed out too rapidly it is a bad sign; it shows that there is an excess of bile in the gall-bladder, and also a weakness of the retentive power.

A delay in the passages of faecal matter through the body denotes a feeble digestion, coldness of the intestines, abundant moisture; taking too much sleep; flatulence.

The Characters of Normal Stool

676. The stool should be (1) coherent; (2) homogeneous throughout, the water and the solids being intimately admixed; (3) soft and honeylike in consistence; (4) easily evacuated; (5) of a colour tending to yellow (if the colour should resemble that of the food it would mean indigestion); (6) of not very offensive odour, yet not odourless; (7) of a quality which is neither sharp nor biting; (8) it should emerge inaudibly, neither with gurgling, nor flatus, nor creaking, nor foamy; (9) passed at the time customary to the healthy person; (10) in bulk nearly equal to that of the food consumed.

Note that neither homogeneity nor softness is necessarily a laudable character in faeces. These characters may be the result of violent maturation throughout the body, or of oxidation or colliquation. In such cases, these features would be unfavourable signs.

Note, too, that a consistence which is tending to tenuity is not favourable unless there is no rumbling or discharge of flatus at stool; it should not then emerge bit by bit. But one must also be sure it is not being discharged in that form owing to the admixture of some irritant which prevents cohesion.

. . . . . .

677. Many authors proceed from the discussion of urine and faeces to other excretions, including the sweat. I consider it more appropriate to deal with these under their appropriate headings in the volume on special diseases.

THE EXPECTORATION

(From Aegineta ; Haly Abbas)

§ 240. The expectoration denotes some affection in the organs of respiration.

	Quality.	Cause.	Disease.
Consistence.	Thin and scanty.	Attenuated humour.	Not fully developed.
	Moderate ; homogeneous, white, unctuous.	Attenuated humour.	Acme of a disease ; maturation of morbid substances is complete.
	Thick.	Density of humour.	Is declining.
	Indefinite.		Failure of maturation.
Colour.	Black or dark.	Intense heat.	Outlook grave.
	Yellow, golden, frothy, thin.	Deficient maturation.	Outlook not entirely bad.
	Intense yellow, golden, frothy.		Bad significance.
	Green.	Presence of green bile.	
	Verdigris green.		Fatal sign.
	White.	Serous humour.	
	Red.	Sanguineous humour.	
Odour.	Fetid.	Putrefaction.	Lung ; air-passages.
Mode of expectoration.	Easy.		Good sign.
	Difficult.		Bad sign.

Any colour other than that of blood is a sign of a bad intemperament produced by pathological heat. Admixture with colours is intermittent.

The sputum may be described as an excrementitious humour which is forced out through the capillaries of the lung. It is contributed to by proteins which are imperfectly elaborated (e.g. hemialbumose) because of defective digestion. The mucoid material within it forms a film over the respiratory mucous membrane, so that gaseous interchanges are interfered with. This is sometimes shown outwardly as cyanosis, especially when the amount of expectoration becomes very considerable —many ounces a day in some cases.

The Sweat

" Easterns judge much by the state of the perspiration, especially in horse-training. The sweat must not taste over-salt, and when held between thumb and forefinger and the two are drawn apart, must not adhere in filaments." (Burton, v. 488.)

Menstrual Fluid

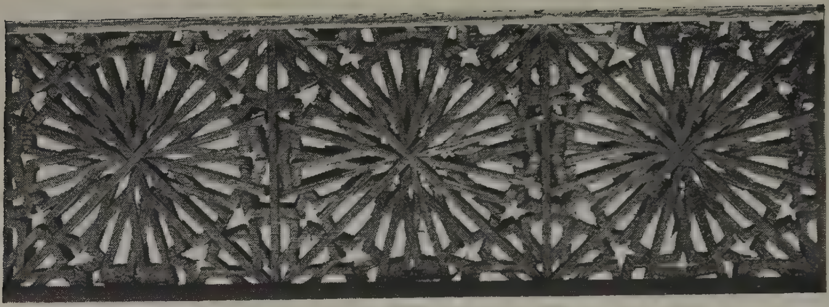
This may be mentioned as being one of the excretions. Its characters are usually only noted in relation to lochial discharge.

Part III

THE PRESERVATION OF HEALTH

CONTENTS

PAGE
PREFACE - - - - - - - - - - 358
I. ON NUTRITION - - - - - - - - 363
II. THE REGIMEN APPROPRIATE FOR THE VARIOUS PERIODS OF LIFE - - - - - - - - 381
III. THE REGIMEN FOR THE AGED - - - - - 432
IV. THE REGIMEN APPROPRIATE FOR VARIOUS INTEMPERAMENTS 437
V. THE REGIMEN APPROPRIATE FOR CHANGES IN THE CLIMATE AND SEASONS - - - - - - - 443
VI. THE REGIMEN APPROPRIATE FOR TRAVELLERS, SEAFARERS, AND THOSE LIVING IN HOT AND COLD COUNTRIES - 446



PREFACE

On the Causes of Health and Disease ; the Necessity of Death.

678. In the first part of this book it was stated that Medicine comprises two parts, one theoretical, and one practical, though both are really simply speculative science. That which is specially named " theory " relates to the formation of opinions and the showing of the evidence upon which they are based, without reference to the mode of acting upon them. Thus this part deals with the temperaments, the humours, the faculties ; and with the forms, the symptoms, and the causes of disease. That which is specially named " practical " relates to the mode of acting upon this knowledge, and the prescription of a regimen.

For instance, it is that part of Medicine which helps us to understand how the health of the body is to be maintained in this or that state, and by what means we can heal the diseases with which the body is afflicted. " Practical " does not refer to the performance of surgical operations. It is the *art* which teaches us *in what way* to procure healing—the " healing " art.

Having expounded in the first and second parts of this work the various matters pertaining to this theoretical part of Medicine, we now proceed to the study of the two subjects pertaining to the practical part—dealing with them in a general manner.

The two parts which belong to the practical side of Medicine are (1) The science of regulating the healthy body, so as to maintain it in health. The science of hygiene. (2) The science of ruling the sick body so as to enable it to return to a state of health. The science of healing.

In this part then, the third, we write down fully how the health is to be maintained.

* * * * * *

679. The human being takes its origin from two things—(1) the male sperm, which plays the part of "factor"; (2) the female sperm [menstrual blood], which provides the matter.

Each of these is fluid and moist, but there is more wateriness and terrene substance in the female blood and female sperm, whereas air and igneity are predominant in the male sperm. It is essential that at the outset of the congelation of the two components there should be moisture, even though earth and fire are found in the product. The earth provides the firmness and rigidity; the fire provides the maturative power. These give the coagulum ("He created man from a clot"—Q. 96, 2) a certain hardness or firmness. But this hardness is not as great in degree as that possessed by a stone or metal [or glass]. For these are either not soluble at all or only soluble to a degree imperceptible to our senses, however long one exposes them to solvents. Were the hardness comparable to this, the product of conception would never suffer injury however long or however persistently a solvent were applied. But that is not so. The fact is contrary.

680. Our bodies are exposed to injury from two directions—one exterior and one interior. The interior source of injury is the dissipation of the moisture from which we are created, and this dissipation proceeds in an orderly manner. The second source is the putrefactive breakdown and metamorphosis of the humour, into a form such that the fermentative phenomena of life are no longer able to proceed.

The second source of injury differs from the first in that dryness is here introduced in virtue of *depravity* of humour; and this dryness continues neutralizing the moisture of the body until the "form" ceases to have a capacity for life.

Finally, the putrefactive breakdown disperses the vitality, because it first destroys the moisture and then disperses it, and simply dry ash is left behind.

681. Hence we see that these two sources of destruction [of the living product of conception] are different from those arising from other causes—such as, freezing cold, torrid heat, grave forms of loss of continuity, various maladies. But it is in regard to the first two-named sources of destruction that we find the more important factors relative to the question of the preservation of health.

Each of them takes origin from extrinsic and intrinsic agents. The extrinsic agents are, e.g., the atmosphere, which is a solvent and putrefacient. The intrinsic agents are, e.g., the innate heat, which is the agent within us through which moisture is dispersed : the extraneous heat generated within us from the aliments, and through other agents which cause putrefactive changes in the [native] moistures.

All these agents mutually aid one another in rendering the body dry. And yet it is true that our perfection and soundness and the power to perform our various actions depend on a due degree of dryness of the body. But the degree of dryness becomes relatively greater and greater until we die. Hence this dryness is inevitable.

682. If we were at the outset essentially composed of moisture, heat would have to overcome it or else the heat would be choked by it. Therefore the heat continues to exert its own effect,—that is, it produces more and more desiccation. But whatever degree of dryness there might be at the outset (of life), it reaches equilibrium, and remains so until the limit of equilibrium in regard to dryness is reached. The heat remaining constant, the dryness is now [relatively] greater than before ; for the " matter " is less, and hence holds more. Hence it is not difficult to understand that the dryness passes on beyond the stage of equilibrium, and goes on steadily increasing until the whole of the moisture of the body is consumed. Therefore (we may say) that the innate heat is the cause of its own extinction, for it is itself the reason for its own " matter " being consumed. We may compare it to the flame of a lamp ; the light goes out when all the " matter " has been used up.

As the dryness increases, the innate heat diminishes. The loss continues unceasingly till death, and the moisture which is lost is not restored. The loss goes on more and more.

683. The dryness (of the body) is increased in two ways : by lessening of the power of receiving " matter " ; by lessening of the native moisture resulting from dispersal of the (innate) heat. The heat becomes more feeble because dryness predominates in the substance of the members, and because the innate moisture becomes relatively less. The innate moisture is to the innate heat as the oil of a lamp is to the flame. For there are two forms of moisture in the flame : water, which holds its own, and oil, which is used up. So, in a corresponding manner, the innate heat holds its own in respect of the innate moisture, but is used up *pari passu* with increase of extraneous heat, due, e.g., to defective digestion, which is comparable with the aqueous moisture of the flame. As the dryness increases, the innate heat lessens, and the result is natural death.

684. For the reason why the (human) body does not live any longer than it does lies in the fact that the initial innate moisture holds out against being dispersed both by the alien heat and by the heat in the body itself (both that which is innate and that derived from bodily movement). And this resistance is maintained as long as the one is weaker than the other, and as long as something is provided to replace that which has been thus dispersed—to wit, from the aliment. Furthermore, as we have already stated, the power or faculty which operates upon the aliment in order to render it useful in this way only does so up to the end of life.

685. Therefore we may say that the art of maintaining the health is not the art of averting death, or of averting extraneous injuries from the body ; or of securing the utmost longevity possible to the human being. It is concerned with two other things—(*a*) the prevention of putrefactive breakdown ; (*b*) the safeguarding of innate moisture from too rapid dissipation, and maintaining it at such a degree of strength that the original type of constitution peculiar to the person shall not change even up to the last moment of life.

This is secured by a suitable regimen, namely (*a*) one which will ensure the replacement of the innate heat and moisture which are dispersed from the body as exactly as possible ; and (*b*) a regimen which will prevent any agents which would lead to a rapid dessication from gaining the upper hand—excluding agents which produce a normal desiccation ; (*c*) one which safeguards the body from the development of putrefactive processes within it and from the influence of alien heat (whether extraneous or intrinsic).

For all bodies have not the same degree of innate moisture and innate heat. There is a great diversity in regard to them.

686. Moreover, every person has his own term of life, during which the desiccation inevitable to his temperament (constitution) and the degree of innate heat, and of innate moisture can be withstood.

687. Nevertheless, factors may arise which assist desiccation, or are injurious in some other way. For which reason, many assert that the former are natural causes of death, whereas the latter are accidental. And under this view, the art of maintaining health consists in guiding the body to its natural span of life by paying attention to whatever things conduce thereto. There are two faculties to be fostered by the doctor in striving for this object : (1) the nutritive faculty, whereby that is replaced which is constantly being lost to the body—namely earthiness and aquosity; (2) the sensitive faculty (animal faculty)—that is, the pulsatile faculty which is concerned with the replacement of that which is lost to the body by the breath—namely "air" and igneity. And since aliments are only potentially like the thing nourished, an alterative faculty had to be created so that they could be changed actually into the likeness of the thing nourished. In this way the aliment becomes effective.

The instruments and channels necessary for this had to be created also—namely the means by which material is attracted, expelled, retained, and digested (sequence by sequence, turn by turn).

688. Therefore we may say that the essential considerations in the art of preserving the health consist in maintaining equilibrium between all these various concomitant factors. But there are seven matters concerning which special care must be expended to ensure just proportion:

(1) Equilibrium of temperament.
(2) Selection of the articles of food and drink.
(3) Evacuation of effete matters.
(4) Safeguarding the composite.
(5) Maintaining the purity of the air respired.
(6) Guarding against extraneous contingencies.
(7) Moderation in regard to the movements of the body and the motions of the mind, with which may be included sleep and wakefulness.

689. From all these considerations you will now perceive that there is no single fixed limit to which equilibrium, or health is to be assigned. None of the temperaments enters into it. Health and equilibrium vary (in range) from time to time. That is to say, it is a state comprised within two limits.

We therefore begin by discussing first the regimen appropriate to the period of infancy, in which the temperament is continuously at one extreme of equilibrium.

THESIS I

ON NUTRITION

1. The Regimen in Infancy—the Period from the Moment of Birth to the Commencement of Weaning.

SPECIAL chapters discuss the regimen during pregnancy and the period when parturition approaches.

690. *Treatment of the Cord.* Many wise physicians state that when an infant of equable constitution is born, the umbilical cord should be severed four fingers' breadth from the umbilicus after it has been well but gently tied with a clean woollen ligature, so as to inflict no pain, and that an oiled cloth should be placed upon it. To help the separation of the cord, apply equal parts of the following : turmeric, dragon's blood, Persian gum, caraway, sweet scented moss, myrrh. These are ground together and applied.

691. *Treatment of the skin.* Then one should hasten to harden the surface of the skin by the use of slightly salted water until the cord has desiccated. The best agents to employ for this purpose are shādanaj (a stone, shaped like a lentil or bloodstone), bitter costus, sumach, fenugreek, and origanum. But the nose and mouth must not be exposed to such agents.

The reason for hardening the body in this way is that everything hot, cold, or rough is injurious to the sensitive infant's skin, and so it needs to be hardened against all things of that kind which will come in contact with it. Hence, if the process of salting has to be repeated, so do.

Such treatment is the more indicated if there are sordities or there is much humidity.

After this, the body should be laved in tepid water, the nostrils thoroughly cleansed with the fingers, whose nails are cut short, and a little oil should be instilled into the eyes. The anal orifice should be caused to move by manipulation of its vicinity by means of the little finger, so that it may open. Care should be taken that nothing cold comes in contact with it.

After the cord has separated—which should be in three or four days—the stump should be treated with a measure of bone-ash or powdered lead oxide in wine.

692. *Binding the Infant.* In doing this the limbs must be handled very gently. Every part should be moulded according to its appropriate form—making wide that which should be wide, slender that which should be slender, doing all as gently as possible between the tips of the fingers. This should be done many times.

The eyes must be carefully wiped with a silken band.

The bladder-region should be pressed to help the exit of the urine. After this, stretch out the hands towards the knees. Bind the head, fitting as it were a cap to the head.

693. *Sleeping-quarters.* The infant must be placed in an airy room, with not too cool air. The room should also be shady, or even slightly gloomy so that the eyes are not likely to receive direct light. While sleeping the head should be at a higher level than the rest of the body, and someone should watch lest any part of the body (neck, limbs, back) should get into a twisted position.

694. *Bathing the Infant.* In summer time it should be bathed with suave tepid water. In winter the water should be on the warm side.

The best time to wash the infant is after a long sleep, but it may be desirable to wash it twice or three times in the day.

In winter, the infant should not be washed unless its body becomes ruddy and warm thereby. After taking it from the bath, take care none of the water gets into its ears.

695. *The way to hold the infant while washing it:* take it by the right hand, and hold it so that the left arm is over its chest and not over its belly. After the laving, the palms and soles should be gently raised (up and down). It should be gently wiped dry with soft cloths. Then turn it down on to its belly, then back on its back, rubbing gently all the while, pressing and moulding [and singing gently to it,—Ch.M.], then back on its belly to apply the binder. Afterwards instil sweet oil into its nostrils, and bathe the eyes and lids.

2. The Regimen during Lactation and Weaning.

696. The following is the mode in which the feeding of the infant is to be arranged. Whenever possible, the mother's milk should be given and by suckling. For that is the aliment of all others most like in substance to the nutrient material which the infant received while in the womb—the menstrual nutrients of the mother. It is these which are changed into milk after parturition, and such milk is better adapted for the infant.

Macrobius (Saturn, v. 11) gives the following reasons why the healthy mother should suckle her child. " Just as the strength and nature of the semen goes to fashion the likeness of the body and mind, so the natural dispositions and properties are conveyed by the milk. And it is not only in man that this is noticed. It occurs in cattle also. For it is easily shown that when young goats are brought up on sheep's milk, their hairs become softer, and when lambs are brought up on goat's milk the wool becomes harder."

Experience shows that merely to place the mother's nipple into the infant's mouth is a great help towards removing whatever is hurtful to the infant.

697. It should suffice for the infant to suck the breast twice or thrice in the day at first, and it should not be allowed to take too much. It is best to wait till the [disturbance in the] temperament of the mother has subsided somewhat before the infant is given the breast. It may be give a little honey first, and the breast later.

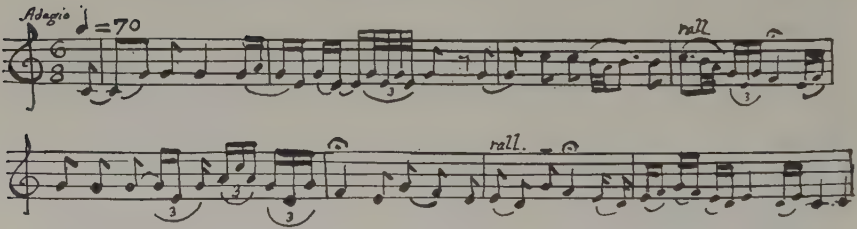
The milk which the boy sucks should be drained away two or three times in the morning, before presenting the nipple, especially if there be any spots in the milk. Sourish or otherwise defective milk should not be given while the nurse is fasting.

698. Besides this there are also two other things to be done to help to strengthen the constitution : gentle (rocking) movements ; humming music or some old song, or prattling to the infant, as is customary while placing the babe into its cradle. How much these two practices are to be employed may be judged [individually] ; the movement is for the benefit of the body, and the music is for the benefit of the mind.

§ 240*a*.—Some idea of the cradle-songs actually used in the days of Avicenna may be formed from the instances recorded by Fox-Strangeways in his work on the Music of Hindostan (pp. 62-68). The words of Rama's lullaby may be quoted : " In Ayodhya, the land of kings, It was Vishnu's self That was born on the lap of Kaushalya. Little babe, sleep upon my knee !—For the cradle is wrought of gold, And a Child therein, Of the whole world the Lord and Master, sleeps. Little babe, sleep, sleep upon my knee !—In the hand-hold of Kaushalya Is the cradle-cord, And the cord is the thread of Bodhana (= Knowledge). Little babe, sleep upon my knee.—And the Devis (= angelic beings) are strewing flowers From the highest heaven, And with each flower a blessing on the Child. Little babe, sleep upon my knee ! "

Another illustration may be quoted to show the beautiful spirit in these lullabies. In singing such words over her babe, the mother must surely create an atmosphere around it which is for the benefit of its mind:

> "Baby mine, light of my eyes,
> Here in thy cradle bright with flowers
> Through sunny hours I bring thee sleep,
> I rock thee and sing thee to sleep
> On the wings of my melodies . . .
> Srinangam island rises fair
> Where the divided Kāverīs meet
> I lay thee down there at His feet,
> At Srīranga rāja's feet
> Full sure of His tender care . . .
> The golden nails no longer move
> On which my baby's cradle swung;
> The song is sung; my ship is borne
> Safe home, my ship is borne
> Safe on the ocean of love. . . ."



699. *Inability to nurse the Child.* If there be anything to prevent the mother from giving milk to the babe—for instance, owing to her weakness or to the defective quality of her milk, or because it runs too quickly, a wet-nurse should be selected according to the following rules: (1) age; (2) form or physique; (3) personal character or habits; (4) the shape of the nipples; (5) the quality of the milk; (6) the interval of time which has elapsed since her parturition; (7) characters of her own child.

Having found a wet-nurse in whom the requisite conditions are fulfilled, she must be provided with nourishing foods such as are given in **708.**

700. *The characters of a good wet-nurse.* (1) The age should be between 25 and 35, because during this period there is youth and health and perfection. (2) Form and physique. The colour should be good, the neck strong, the chest strong and broad, the flesh muscular and firm,—neither very fat nor very spare, the proportion of the fat in the flesh being moderate. (3) Personal character and habits. These should be good and praiseworthy. She should be only slowly aroused by the bad passions of the mind, such as anger, gloom, fear, etc. For all these injure the constitution and may change the milk or pass into it, or even prevent its secretion. It is for this reason that some people reject a nurse who is stupid. Besides this, if the character be not good, she will not trouble herself over the infant or caress it enough. (4) Shape of nipples. They must be firm in consistence and large, but not too large. [On the one hand large nipples hurt the infant's gums and impede deglutition, and on the other they will hold more milk than the infant can take, and some is then left behind to undergo decomposition, therefore being injurious at the next feed. If the nipples are too small, the infant cannot take hold of them, and there will not be sufficient milk : Aetius.] Therefore the consistence should be between hardness and softness. (5) Quality of milk. The consistence must be between coarse and fine ; the colour white (not dusky, greenish, yellowish or ruddy) ; the odour good, without acridity or pungency ; the taste sweetish (without any bitterness, saltinesss, or acridity). The quantity should be of a certain amount. It must be homogeneous. It must not be thin, watery, nor very thick or cheesy ; nor must there be any discrete particles in it. There should not be much foam.

701. *Tests.* The consistence may be tested by allowing the milk to run over the finger-nail. If it flows easily, it is thin ; if it does not flow over the inclined nail, it is thick. Again, place some in a glass vessel, and drop a little myrrh into it, and stir the two together. The aquosity and the degree of caseity are then evident. The milk is laudable and attempered if the watery part and cheesy part are equal.

Should there be some special need to prepare such a milk, we should prepare it partly from the mother, and partly from the wet-nurse. From the mother because it is better not to give thick milk of unhealthy odour until it has been allowed to stand exposed to the air for a while ; and because it is best not to give very warm milk to the fasting infant.

702. *Diet.* If her milk is thick, the wet-nurse should take oxymel ; and a decoction of attenuants such as wild marjoram, hyssop, thyme, savory, origanum montanum, and the like should also be included in the menu. A little radish may be added [old pickle in vinegar and honey : Aeg.]. Vomiting should be induced with hot oxymel to get rid of the phlegm. (Suitable) work before meals will help to thin the milk. [Frequent baths : Aetius.]

If the wet-nurse be of hot intemperament she should take acetous syrup, and a light wine should be taken either at the same time or separately.

703. If her milk is thin, one should instruct the nurse to rest, and avoid exercise or work, and she should be given foods which thicken the blood. If there is no contra-indication, one might allow her sweet wine. [The following are also recommended: strong soups or broths (Aeg.), a gruel prepared with fennel; green dill boiled in a ptisan with fine bread, pork-flesh, flesh of kids, or of tender birds: Aetius.] Allow plenty of sleep.

704. If the milk is scanty, one should ascertain the cause: e.g. is it an abnormal temperament affecting the whole body, or the breast itself? To determine which it is one employs the indications given in preceding chapters. If palpation of the breasts shows them to be unduly hot, the diet should consist of such things as barley water, spinach, and the like. If there are signs of coldness of temperament in the breasts, and of obstructions, or inadequate attractive power, the diet should include attenuated aliments tending to a warm nature; and cupping instruments should be applied beneath the breasts, taking care not to press much on the breast. Carrot seed is also beneficial, and the carrot itself is also very good for such a condition.

Should the cause be that the nurse has been previously insufficiently fed, she should be given a broth made with barley, bran and legumes, and such as the following should be introduced: fennel roots, and seeds, and dill, and nigella. Others say that the udders of sheep and goats should be eaten with the milk therein contained, as being helpful in virtue of that which is of like nature or property in such foods. Others have recommended the administration of an "ounce" of tree-worms or dried earth-worms in barley water for several days, saying they have found it excellent for the purpose. So also the expressed juice of the heads of salted fish, taken in dill water.

705. *List of Galactogogues.* (1) One ounce of butter from cow's milk placed into a vessel of good wine; taken as a drink. (2) sesame ground up in a fine mill and mixed with wine; taken as a drink. (3) An emplastrum or liniment applied to the breasts, prepared with the faex of balsam of nard and asses' milk and oil. (4) Take one ounce of the interior parts of brinjal (egg-plant), this being dissolved in wine, by stirring; it is taken as a drink. (5) The following is a powerful medicament: dill seed, three ounces; seed of blue melilot* (or, lot tree),† of leek, one ounce of each ; clover seed and fennel seed, two ounces of each ; mix the whole into a drink with fennel juice, honey and butter. [(6) (Aegineta) : broom leaves taken in dark-coloured wine or in a ptisan ; sweet gith (melanthium), and the root and seed of carrots soaked in warm water. Aegineta warns that such remedies are weakening to the body).] (7) Massaging the breasts frequently with bland hands renders the secretion of milk plentiful.

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* Melilot: a sort of clover. The blue melilot or 'curd herb' gives the odour and flavour to Schabzieger cheese, the dried flowers being used.

† The lot tree: pyrus aria, or white beam-tree (apple tribe) (Lindley and Moore).[132]

706. *Anti-galactogogues.* If the milk is injuriously abundant, or has accumulated because it is unable to escape owing to the presence of some form of obstruction, or because the milk is too thick, one may reduce the quantity secreted (1) by reducing the amount of food ; (2) by employing those articles of diet which contain but little nourishment ; (3) by applying a (discutient) plaster over the chest and breasts, composed of caraway in vinegar or white clay in vinegar, or of lentils boiled in vinegar ; this is followed up by a draught of salted water ; (4) by eating mint.

If the milk has an unpleasant odour, the remedy is to give as a drink a fragrant wine ; and as food, foods of pleasant odour.

707. (6) Rules regarding the period of time which has elapsed since the wet-nurse was herself confined.—The birth should have been recent, namely 1½ months at least (two months, if the child was a male) ; the birth should have occurred at the proper date and not premature ; nor should there be a history of habitual premature births.

708. *Regimen of wet-nurse.*

Diet : the aliments should consist of food giving good chyme. For example, foods such as wheat, frumenty, lamb, kid of goats, which are not putrescent or have hard flesh. Lettuce, almonds, filbert-nuts. Mint. Potherbs which are deleterious: herb-rocket, mustard, mountain balm—for they cause the blood to undergo decomposition. [Aegineta also advises against desiccative, salt, acrid, acid, sour, bitter and heating articles of food ; foods having an offensive smell ; very fragrant things ; condiments ; alcohol.]

Exercise. This should be moderate. [Aetius says : work with the hands and shoulders, milling, weaving, carrying the child about in the arms.

Personal : cleanliness of person (Aetius).] The wet-nurse should not allow coition, for this disturbs the menstrual blood and diminishes the quantity of milk and alters its composition, as shown by change of odour. Moreover she might become pregnant, in which case there would be a dual unpropitious influence—to the wet-nurse herself in that whatever is attenuated in the blood enters into the nutriment of the embryo, and to the embryo in that it loses as much from the mother's aliment as passes on to form milk.

709. During the whole period of lactation, especially the first lactation, it is advisable to have some of the milk drawn off to encourage and facilitate its flow ; this is also aided by massage, otherwise the delicate organs of suction will be injured and weakened. It is a help to anoint with a little honey each time before the infant is nursed ; and a little wine may also be added. It should not be allowed to take much milk at one time. It is better to feed little and often, at small intervals. For it may happen that after becoming satiated with the whole of the contents of the breast the infant suffers from distension, and very much flatulence, and the urine becomes white [too watery, Aeg.] In such a case, the best thing is to stop the nursing, allowing the infant to go hungry for some time, and it should be meanwhile put to sleep till digestion has had time to be completed. [It is unduly sleepy if over-fed.]

At first, the infant is allowed the breast three times only in the day. Should it be necessary to feed it on the first day, it would be better for someone else than the infant's mother to do so, as we have explained.

Should the wet-nurse develop an intemperament or a painful malady, or have diarrhoea, or be constipated, someone else should give milk until she is better. The same applies if it be necessary to administer to her some medicine which has a decided potency or quality.

The infant is laid to sleep after feeding, but its cradle must not be rocked vigorously as otherwise one would churn the milk in its stomach. The rocking must be quite gentle.

It is good for the infant to cry a little before the feed.

710. *Duration of lactation.* Normally this is two years. When something additional to milk is required, such addition should be made step by step. Weaning must not be abrupt.

> " He committed the child to the nurse, and he drank milk two years, after which they weaned him, and he grew up, and throve, and walked upon the floor." (Night 250).

After the first two teeth have appeared, a progressively stronger aliment is to be considered. Hard things, however, must not be allowed. At first, bread is given which the nurse has masticated. Afterwards, bread softened with honey water, or dilute wine or with milk. This is followed by a little water, or even a little wine in the water. It must not be allowed to take food to repletion. Should indigestion or flatulence occur, and should the urine become white, all food is stopped for a while, at least until it has been anointed in the bath.

711. *Weaning.* In weaning the infant from milk, the aliment must consist of articles which can be sucked up ; and the replacement of milk by " acorns " of bread and sugar should be gradual. Soft meats may be given. If the infant persistently seek for the breast, crying for it, the best thing is to prepare a paste to apply to the breast, made of four ounces of myrrh and smoothly ground pennyroyal.

712. *Regimen up to Dentition.* To sum up, we may say that the regimen of the infant is to be humectant, corresponding to its temperament at this period, for this is necessary both for nutrition and growth. The infant is also to be exercised gently correspondingly to the needs of nature, and especially during the later period of infancy.

[The word " exercise " includes lulling with music and singing lullabies: exercises are to be followed by gentle rubbing ; and after that comes the bath, which must not be cold. (Aegineta.)]

When the child begins to creep about, it must not be allowed to make strenuous efforts, or be encouraged to walk or sit erect before the natural desire to do so appears ; otherwise there may be injury done to its legs and back. When it first sits up or creeps over the ground, it is best to place it upon a smooth skin, to prevent injury by roughness in the floor. Bits of stick or any objects able to pierce or cut the skin must be kept out of its way. Care must be taken that it does not fall off some elevated place.

713. *Hygiene of Dentition.* When the canine teeth are about to appear, the infant must not be allowed to chew at anything hard lest the material from which these teeth need to be made should become dissolved by the processes of mastication. The gums should be rubbed with hare's brain and cock's fat, as this will help their eruption. After the appearance of the teeth, the infant's head and neck should be rubbed with oil which has been shaken up with hot water [to cleanse it], and a little of the same oil may be instilled into the ears.

As soon as the infant is able to bite with its teeth, it will show this by trying to bite its own finger. It should then be given a stick of not too dry liquorice root or inspissated Spanish juice to chew at, for this will be beneficial at this period and will prevent ulcers from forming in the gums and dull the pain [and irritation of teething]. The gums may also be rubbed with salt and honey to relieve the pain.

When the teeth are fully out, the infant may be given a stick of liquorice or root of liquorice (not too dry) to bite at. When the canines are fully out it is good also to rub the neck with some form of sweet oil. Later still, when the infant begins to talk, its teeth should be rubbed, especially at their bases.

3. CONCERNING THE DISEASES OF INFANCY

714. The chief mode of treating infants is by controlling the wet-nurse. If there should be any suspicion of plethora of blood in her, bleeding or cupping should be done. If there be plethora of some other humour, that must be drained also. When it is necessary to bind, or to loosen the bowels, or to prevent the ascent of vapours to the head, or to rectify the respiratory organs, or to correct an intemperament, the method of treating this is by way of the food and drink [of the nurse]. If it becomes necessary [for the nurse] to procure plentiful evacuation by the bowel, or if this occurs spontaneously ; if emesis needs to be procured, or if vomiting occurs spontaneously, it is best to give the infant to someone else to nurse during that period.

715. DISORDERS DURING DENTITION

Inflammation of the gums (gingivitis) may occur during dentition. Inflammations may also occur in the ligamentous structures round the mandibles, causing trismus. In such cases one should gently press the parts with the finger and rub in one of the oils named in the section dealing with the eruption of the teeth, or honey which has been well mixed with oil of chamomile, or with turpentine oil. One may also pour warm water, in which chamomile and dill have been boiled, over the top of the head from a height. (Cf. **414**.)

For *burning pain in the gums* apply oil and wax as an epitheme or use salted flesh which is a little " high."

[Aegineta advises rubbing the gums frequently with the finger alone or anointed with fowl-grease, while the infant is in the bath. When the teeth are just about to show anoint the head with sweet oil and drop some into the ears. He recommends the amount of food to be increased, and advocates warm baths. For itching of the gums, he says the flesh of an old pickle will relieve.]

Diarrhoea. This is specially apt to arise *during dentition.* Some account for it as due to the sucking in by the infant of salty sanious effete matters from its own gums along with the milk. But it is possible that this is not true ; that the real cause is an interference with the natural faculty, so that digestion is imperfect and pain results. It is just this that hinders digestion in feebly constituted infants.

Cf. Modern teaching : " Vomiting and diarrhœa must always be looked upon as due to some cause other than dentition, particularly to improper feeding.—Elder and Fowler.[150]

If it is only slight, you will not be asked to treat it. If the parents are afraid it will become injurious, leading to wasting, one would treat by applying rose-seed, caraway, anise, and celery (parsley-) seed [sprinkled on wool : Aeg.] to the abdomen, or apply a plaster prepared with caraway and roses infused in vinegar, or with frumenty boiled in vinegar. Should this fail, use a sixth part of a dram of goat-cheese in cold water, taking care to prevent curdling of the milk in the infant's stomach by replacing the milk for that day with the soft yolk of an egg, or with morsels of bread boiled in water, or ground wheat boiled in water. [Hot desiccants may be used : Aeg.]

Constipation during dentition. The treatment is by a suppository made with well-cooked honey, or with pennyroyal, or with iris-root (in the natural state or after scalding). A little honey may be given in the food. As much oil of turpentine as makes the bulk of a chick-pea may be gently rubbed over the abdomen ; or olive-oil ; or some ox-bile may be applied over the thigh or over the navel. Or maidenweed (bakhūri maryam) may be applied. [Or the abdomen may be anointed with mint pounded in honey : Aeg.]

716. *Convulsions during dentition.* This is generally due to fermentative changes in the digestion, aided by nervousness, especially if the baby is over-fat and humid in constitution. The treatment is to use oil of iris, lily, alkanna, or mallow. [Aetius advises against figs and acid foods.]

Grave convulsions during dentition ; "tetanus." This is treated by water in which cucumber [or heliotrope] has been boiled ; or by oil of violets admixed with oil of cucumber [or oil of privet : i.e. calefacients : Aeg.].

If there is reason to suppose that the convulsions are due to dryness, because they develop after fevers, or after severe diarrhoea, and because they gradually become more pronounced, then the joints should receive an inunction with violet-oil (alone or beaten up with a little white wax), and violet-oil may be applied to the head. The same things should be employed vigorously if " dry " tetanus develop.

To the lay mind, all forms of gastro-intestinal catarrh, skin eruptions and nervous phenomena (particularly convulsions) are attributed to dentition. Beyond admitting that there is usually some congestion of the gums, with exaggerated salivation, some loss of appetite, restlessness, temporary rise of temperature, and general uneasiness, Elder and Fowler (*loc. cit.*) teach that these various phenomena depend chiefly on rickets, and nutritional errors. There is however something to be said for the lay view.

After the teeth have appeared, Aegineta recommends the infant to be allowed to bite at a piece of nearly dry decorticated iris root. Butter and honey should also be inuncted.

717. *Incessant crying, with loss of sleep.* The mouth is constantly whimpering. [The causes of persistent crying are : heat ; cold ; fleas ; gnats ; hunger ; thirst ; retained urine—for which give melon-seed and julep to both nurse and child ; retained faeces—for which give the nurse laxatives, herbs, olive oil, prunes : Haly Abbas.] For this condition it is necessary to make it sleep if possible, by giving poppy bark and seed, and oil and lettuce and apply poppy oil to the temples and vertex. If this does not suffice prepare the following medicament : Take bugle seed, juniper berry, white poppy, yellow poppy, linseed, celandine seed, purslane, plantain seed, lettuce seed, fennel seed, aniseed, caraway ; some of each is roasted little by little ; then all are rubbed together. Add one part of fried fleawort seed which is not powdered. Mix the whole with a like amount of sugar and give two " drams " as a potion.

If it is desired to make it still stronger, one should add an amount of opium equal to a third part of it or less.

718. *Night-terrors.* These are often due to over-repletion with food, which undergoes putrefactive change. The stomach is aware of this. An injurious effect passes on from the sensitive faculty to the formative and imaginative faculties, wherefore the terrifying visions arise. It is necessary therefore to see that the stomach is not full at bed-time ; honey should be given the infant to lick, and in this way it will digest that which is in the stomach and displace it.

719. *Water on the Brain.* This is discussed under the heading of diseases of the head.

Inflammation in the brain. Siriasis. There is pain in the eyes and the throat, and the face becomes yellow. [The body is dry ; the fontanelles are depressed, the orbits sunken : Aeg.] Hence the brain must be rendered cool and moist by the use of cortex of cucumber, parings of gourd, juice of garden nightshade, and especially purslane juice, and rose oil with a little vinegar, and rose oil with egg-yolk. Each of these is constantly changed.

720. AFFECTIONS OF THE MOUTH. *Aphthous stomatitis.* Aphthae. Thrush.—Aphthae are plentiful when the lining membrane of the tongue and mouth is too delicate to bear touching, even by the wateriness of the milk, for it is this that is injurious to it, and gives rise to the aphthae. The condition is worse, and dangerous to life, if they remain immature and black like charcoal. The condition is more favourable if they are white or yellow. The treatment is to employ some such gentle medication as is described in special treatises on the subject. Sometimes triturated violets are sufficient by themselves ; sometimes they need mixing with roses, a little saffron, and carob-bean. Or, again, lettuce-juice, nightshade juice, purslane juice [and endive-juice] may suffice. If treatment is still resisted, use bruised liquorice root.

Galen advised cooling astringent washes if the mucous membrane is red ; more refrigerant washes if it is yellow ; detergents if it is white, and, according to Alsaharavius, a powder of myrtle, saffron, and sugar. The strongest discutients (sandarach, rose-oil) are needed, if the mucous membrane is black.

When aphthae are associated with boils in the gums, it is beneficial to use myrrh, gall, frankincense bark, thoroughly ground up and mixed with honey. An acetous rob* of mulberries, and a rob of unripe grapes may suffice. Sometimes it is advantageous to bathe the gums with honey-water and wine (or, syrup and honey) and follow this up with some of the desiccatives we have named.

If a stronger (astringent) medicament is required, use the leaf-veins and bark of pomegranate, and pomegranate blossoms, and sumach, six drams of each ; galls, four drams ; aniseed, two drams. Rub them together and thoroughly powder them up. Then dust this upon the gums.

721. THE EYE. *Prominence of the eyes.* Apply juice of boxthorn made with milk ; then bathe with water in which chamomile and mountain balm have been boiled.

Whiteness over the pupils, due to much crying, is treated with nightshade juice.

If the eyelids are affected with *blepharitis*, owing to constant crying, treat this also with nightshade juice.

722. THE EAR. *Watery discharge from the ears.* This is due to an undue degree of moisture in the body, especially in the brain. An ointment is prepared with wool-fat, honey, wine, and a little alum, or nitre or saffron. This is then introduced into the ears with a syringe. Or it may suffice to dip wool into a sour wine, or into wine to which a little saffron has been added, and place this in the ears.

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* Lit. juice made thick.

Earache. This may be due to flatulence, or to undue moistness. It is to be treated by juice of boxthorn, origanum, salt, white sugar, lentils, myrrh, colocynth seeds, and cedar [or, savin] seeds. Any of these should be digested in oil and instilled drop by drop.

723. DISTURBANCE OF THE BREATHING. *Difficulty of breathing.* Anoint the roots of the ears and tongue with oil. It would also be very helpful to press the tongue down so as to cause the infant to vomit. Warm water may also be dropped into the mouth drop by drop, and a little linseed and honey be given it to suck.

Abnormal snoring. This is noticed when the infant is in very deep sleep. Give linseed ground up in honey, or ground caraway in honey, to lick.

Snorting, says Aegineta, is due to improper food. The stomach becomes loaded with phlegm. A linseed linctus is to be given, or honey. If that does not suffice to stop it, vomiting is induced as above.

(Laryngismus stridulus may correspond to this and the preceding, since the laryngismus is apt to occur during sleep, and is aggravated by crying, whereas stridor may disappear under both these conditions. The question of adenoids would also come to mind).

Constant sneezing. This may be a sign of cerebral disorder. In such a case this must be treated, cooling the inflammation, by inunction with infrigidant juices and oils. If there be no inflammation, some mountain balm may be insufflated into the nostrils.

Loss of voice in infants is due to constipation. Give cabbage-juice by the mouth or rectum (Aeg.).

724. *Cough and Coryza.* Some people advise for this that the infant's head should be laved in plenty of warm water, and that plenty of honey should be smeared over the tongue. After that, the root of the tongue should be depressed to enable the infant to expel the abundant phlegm by vomiting, which will secure recovery. Small doses of the following demulcents may also be given daily in new milk : gum arabic, gum tragacanth, quince seed, liquorice juice, brown sugar.

725. DIGESTIVE DISTURBANCE. *Weakness of the stomach.* The abdomen should be anointed with musk and rose or myrtle water. Give a drink containing quince juice and a little clove or nutmeg, or three-eighths of a dram of nutmeg with a small quantity of quince-juice.

Severe vomiting. This may be treated with three grains of clove. A plaster containing weak anti-emetics may be applied over the stomach.

Hiccough. For this administer coco-nut with sugar.

726. *Flatulent distension.* The treatment has already been given in the section on diseases of the head. The following very useful measure may be here mentioned. Take equal parts of origanum, castoreum and caraway. Rub them up and mix together. Give the weight of three barley grains in a draught.

Colic. The infant writhes and cries. Hot water applications should be made to the abdomen, using also plenty of warm oil and a little wax.

Griping. This is due to cold. Beneficial for this condition is the following : three drams of each of nasturtium and caraway; grind them together. Pass through a sieve. Intersperse them with old cow butter. Give as a draught with cold water.

727. *Prolapsus ani.* Give pomegranate bark, fresh myrrh, inner rinds of acorns (or, chestnuts), dried roses, burnt horn, alum of Yamen, nails of goats, pomegranate blossoms (unopened) and nails of fowls. Take equal parts and thoroughly boil them together in water until all their virtue has come out. Then give as an enema, tepid.

[Aegineta advises applications of tepid brine or salt water. In modern words : give astringent enemata.]

728. *Hernia.* When a child cries very much, a swelling may form in the groin or navel. This is a hernia. Some advise that it should be rubbed with cardamon (bishop's weed) and sprinkled with egg-white, a thin bandage being applied tightly over the place. Others advise burnt bitter lupin, as an infusion in wine and myrrh, placed over the part. Stronger remedies are : hot styptics (astringents), such as myrrh ; cypress bark ; cypress fruit ; aloes ; acacia fruit. [Compresses of alum, galls, etc. : Aetius.] See also the special chapter on the subject.

729. *Formation of an inflammatory mass between the throat and stomach* [= retro-pharyngeal abscess ?]. This sometimes spreads to the muscles and cervical vertebrae. The treatment is to cause the infant's bowels to act, using a suppository. After that, give mulberry rob and the like.

An *inflammatory mass* may form *in the navel*, especially after the cord has separated. In this case one should use celtic spice and turpentine ; dissolve them in rape-seed oil. They may be given internally or applied as a plaster over the navel.

730. *Worms.* Round worms are very injurious when they arise in the small intestine. Thread-worms are usually round the anus. Flat worms are rare. Round worms are treated with absinthe water (wormwood of Pontus), of which a little is given in milk, according to its concentration. It may be necessary to apply a plaster over the abdomen, made up of Kabul rice, myrobalan, ox-bile, and colocynth pulp. To treat threadworms take one part of each of elecampane and madder [chelidonium ; a kind of cucumber : (other readings)] ; add sugar equal in bulk to the whole. Give as a draught with hot water.

731. DISORDERS OF THE SKIN.—[Aegineta gives the following advice :—(1) Attend to the diet of the wet-nurse. Give sweet articles of food. (2) Attend to the diet of the child ; (*a*) this should not be too rich or too spare; (*b*) avoid constipation: add a little honey to the food; or, should this prove inadequate, add turpentine to the bulk of a chick-pea; (*c*) avoid looseness of the bowels: add millet to the food.]

Furunculosis. Pimples forming all over the body. If they are ulcerating and black it is a fatal sign. If they resemble aphthae, it is also mortal, especially when they spread out. If they are white, it is more hopeful. If red, it is also more hopeful. If they come out freely, it is a better sign.

The treatment in all cases consists in using fine desiccants dissolved in the bath-water, such remedies as rose, myrtle, mastic-leaves, tamarisk, and their respective oils being boiled in the water. [Other remedies recommended by Alsaharavius : lotions of marjoram, mint, centaury ; ointments of spuma argenti, ceruse, armenian bole, sulphur, mercury, almonds.]

If the furuncles are healing, they should be left alone until they are mature ; and they are then treated.

If they are ulcerated, they need an ointment of ceruse. They may need bathing with honey-water and a little nitre, as one does aphthae.

If they scab over it will be necessary to use something stronger. One therefore bathes them with aqueous borax mixed with milk, to enable it to be borne.

If they become vesicular, they should be steamed, and have water poured over them in which myrtle and rose and bogrush (schoenus), quinsywort (asperula) and the (young) leaves of the mastic tree have been boiled.

For *vesicular eruptions*, Rhazes advises : (1) decoction of dates and figs with fennel-water ; (2) when the rash is fully out, give rose-water baths, myrtle-water baths, and then rub the skin with oil of roses.

Intertrigo. Apply ground myrtle as a dusting powder, or use powdered liquorice root [or iris root] ; or finely ground-up rose or galangale, or barley flour, or lentil flour.

Pruritus.—Foment and anoint with refined oil, in which a little wax has been melted (Aeg.). Correct the acrimony of the mother's milk (Alsaharavius). Stop all sweets and salts in the mother's diet, because they inflame the blood. Immerse the child in a bath of mallows, pearl barley, fenugreek, gourds, etc. (Rhazes).

732. *Fevers.* In this case it is best to treat the nurse by giving her such remedies as pomegranate juice mixed with oxymel and honey and succus citruli, and a little camphor and sugar [or, acetous syrup of pomegranate and honey and cucumber juice, with a little camphor and sugar]. Then induce sweating by using fresh reeds, which are squeezed so that their juices can be applied to the head and feet, covering these parts therewith.

4. The Regimen from Infancy to Adolescence

733. The great principle here is the inculcation of control of the emotions. One should take care that they do not give way to anger and fear, or be oppressed by despondency, or suffer from sleeplessness. They should therefore be allowed that which is pleasing and appetizing and one should avoid giving them anything arousing disgust.

There are two useful objects attained in this way. The first is that the mind grows from its very start accustomed to favourable emotions, and develops a fixed habit for good. The second is that the body is also benefited. For just as bad habits of thought supervene on intemperament of the body, so also a physical intemperament may be traced to habits of mind which are contrary to the ideal.

Anger is a strong calefacient. Despondency is a desiccant. Torpor relaxes (retards) the sensitive faculties, and causes the constitution to tend towards the phlegmatic type. Therefore in safeguarding the emotions the health of the mind and body are at the same time maintained.

734. When the child awakes, it should first have a bath. He should then be allowed to play for an hour. Then he should have his breakfast. Then he should be left to play for a long time. Then he should have another bath. Then he should have a hearty [light : Aeg.] meal, but he must not be allowed to drink water with his meal, because otherwise insufficiently digested chyle will become absorbed and disperse all over the body.

735. At the age of six, he may be given tuition by a master [who is of mild and benevolent disposition : Aeg.], who will teach him step by step and in order [cheerfully, without constraint]. He should not be compelled to stay continuously in school. [Relaxation of the mind contributes to the growth of the body : Aeg.] At this age, bathing and rest should be less frequent, and the exercise before meals should be increased.

Wine must not be allowed. This is specially true if the temperament is hot and moist, because the injurious effect of wine—namely the generation of bilious humour, as is seen in topers—readily influences the child. The advantage in wine is that it excites the secretion of urine, thus removing the bilious humour with it, and that it moistens the joints. Neither of these effects are necessary at this age, because his bilious humour is not so plentiful as to need helping out of the body, nor do the joints need moistening. He should therefore be allowed as much sweet limpid water to drink as he wishes.

This is the programme up to thirteen years of age. Care is daily exercised towards lessening the humidities, and increasing the dryness of the tissues, and hardening the body. [Grammar is taught now : Aeg.]

The rule therefore is to allow light exercise, and to avoid whatever entails toil, between boyhood and adolescence. After this age, the regimen is that usual for maintaining the health (in early manhood).

From 14-21, use gymnastic exercise to strengthen the body and prevent indulgence in carnal desires. Wine should be allowed sparingly. Pursue mathematics and begin philosophy (Aegineta).

We may therefore pass on to the subject of exercise, first discussing the essentials for the regimen of young adults, and the subject of gymnastic exercise.

THESIS II

THE REGIMEN PROPER FOR THE PHYSICALLY MATURED.

§ 241.—The Right Use of Adult Life.

How happy is he who takes advantage of early days, and pays his debt (to God)—
Those days when he has power, health, energy of heart, and strength;
That state of youth, like a verdant and fresh garden, yielding produce and fruit unstintingly;
The springs of strength and eager desire flowing, and the soil of the body verdant through them.

Masnavi,[57] p. 107.

The real object of conserving the energies of the body lies in the attainment of spiritual development. The actual bodily occupation is itself, if we will it so, the practical means of that attainment. The energy of will to associate this means of worship with the subjugation of the vices inherent in our frailty must be employed during the early years if we are not to find ourselves in old age powerless to advance along the critical stages of the journey to the only true Goal. This principle underlies the idea of "right Regimen."

The soil of the "body" and the "desires" having been consistently tilled and purified and tended, the coming of old age cannot but also reveal spiritual blossoms full of delight for others. "Do not then wait," says the Masnavi, "till

The soil becomes barren, dry and poor:
Never do fine plants grow from barren soil;
When the water of energy, and the water of eager desire cease
He derives no benefit from himself or from others;
The eyebrows hanging over like a crupper-strap;
The eyes watery and dim;
The face through old age like the back of a lizard;
The articulation and taste defective, and the teeth useless;
The day late, the ass lame, and the road long;
The workshop (i.e., the physical body) gone to ruin,
And the work disorganized,
The roots of a bad nature fixed firmly in him,
And the power to tear them up diminished."

(*Ibid.*, 107-8.)

A picture admirable of the state of affairs in old age; and also full of significance in regard to the well-being of the soul.

1. The General Règimen for the Athletic Age. Collective Discourse upon Bodily Exercise

736. SINCE the regimen for maintaining health consists essentially in the regulation of (1) exercise, (2) food, and (3) sleep, we may begin our discourse with the subject of (gymnastic) exercise. We may define exercise as voluntary movement entailing deep and hurried respiration.

Once we direct the attention towards regulating exercise as to amount and time, we shall find there is no need for such medicaments as are ordinarily required for remedying diseases dependent on [abnormal] matters, or diseases of temperament consequent upon such. This is true provided the rest of the regimen is appropriate and proper.

737. We know that this must be so when we reflect how, in regard to nutriment, our health depends on the nutriment being appropriate for us and regulated in quantity and quality. For not one of the aliments which are capable of nourishing the body is converted into actual nutriment in its entirety. In every case digestion leaves something untouched, and nature takes care to have that evacuated. Nevertheless, the evacuation which nature accomplishes is not a complete one. Hence at the end of each digestion there is some superfluity left over. Should this be a frequent occurrence, repetition would lead to further aggregation until something measurable has accumulated. As a result, harmful effete substances would form and injure various parts of the body. When they undergo decomposition, putrefactive diseases arise.* Should they be strong in quality, they will give rise to an intemperament ; and if they should increase in quantity they would set up the symptoms of plethora which have already been described. Flowing to some member, they will result in an inflammatory mass, and their " vapours " will destroy the temperament of the substantial basis of the breath.

That is the reason why we must be careful to evacuate these substances.

Their evacuation is usually not completely accomplished without the aid of toxic medicines, for these break up the nature of the effete substances. This can be achieved only by toxic agents, although the drinking of them is to a certain extent deleterious to our nature. As Hippocrates says, "medicine purges and ages." More than this, the discharge of superfluous humour entails the loss of a large part of the natural humidities and of the breath, which is the substance of life. And all this is at the expense of the strength of the principal and auxiliary members, and therefore they are weakened thereby. These and other things account for the difficulties incident to plethora, whether they remain behind in the body or are evacuated from it.

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* Bacterial infections.

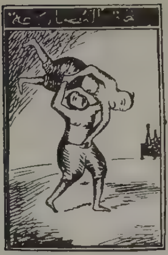
Now exercise is that agent which most surely prevents the accumulation of these matters, and prevents plethora. The other forms of regimen assist it. It is this exercise which renews and revives the innate heat, and imparts the necessary lightness (airiness !) to the body. For it causes the subtile heat to be increased and daily disperses whatever effete substances have accumulated ; the movements of the body help to expel them, conveying them to those parts of the body whence they can readily leave it. Hence the effete matters are not allowed to collect day after day, and besides this, as we have just said, exercise causes the innate heat to accresce, and keeps the joints and ligaments firm, so as to be always ready for service, and also free from injury. It renders the members able to receive the nutriment, in being free from accumulated effete matters. Hence it renders the attractive faculty active, and resolves fibrosis in the tissues, rendering the members light, and the humidities attenuated, and it dilates the pores of the skin.

To forsake exercise would often incur the risk of "hectic," because the faculties of the members are impaired, inasmuch as the deprivation of movement prevents the access to them of the innate breath. And this last is the real instrument of life for every one of the members.

§ 242.—VALUE OF EXERCISE.—(1) It hardens the organs and renders them fit for their functions ; (2) It results in a better absorption of food, aids assimilation, and, by increasing the innate heat, improves nutrition. (3) It clears the pores of the skin. (4) It removes effete substances through the lungs. (5) Strengthens the physique.

Vigorous exercise invigorates the muscular and nervous system.

2. The Various Forms of Exercise.



738. There are two main forms of exercise: (*a*) that pertaining to the ordinary human undertakings; (*b*) that which is undertaken for its own sake, namely for the advantage accruing from its pursuit. [i.e., sports, athletics, gymnastics, etc.]

There are differences between the two forms. One is strong and powerful, the other weak and light; one is speedy, the other slow. Athletics implies strenuous exertion, combining swiftness with energy. Recreative exercise, undertaken for relaxation, implies leisurely movements. There are all grades between these extremes, and there is a mean between them [called moderate exercise].

739. *List of the forms of exercise.* (i) Strenuous forms. Wrestling contests. Boxing. Quick marching. Running. Jumping over an object higher than one foot. Throwing the javelin. Fencing. Equitation, or horsemanship. [Hunting: Galen, Rhazes.]

Equitation "strengthens the body, especially the stomach, more than any other mode of exercise. It clears the organs of special sense, and renders them more acute. But it is most inimical to the chest" (Antyllus).

The mental excitement of hunting is good for many diseases.

Clapping the two hands alternately before and behind, with a quick motion while standing on tip-toes. [Dancing (Oribasius), Swimming (ib)]. These are special forms of individual athletic exercises.

Dancing, said Hippocrates, is beneficial for amenorrhoea, and has been used for procuring abortion.

Swimming in the sea.—This has a warming effect, and strengthens the body, and renders it thin. It is beneficial for dropsy, skin eruptions, elephantiasis. But it may be injurious for the head and nerves. The body must be rubbed with oil first. (Oribasius.)

(ii) The following are recreative or milder modes of exercise. Swaying or swinging to and fro, as when being carried in a litter. Standing or reclining in small boats. Fishing. Sailing. "Gestation"—that is, being driven in horse-carriages, or carried on camels, or in palanquins, or a horse-litter.

[*Military exercises*]. Among the more vigorous exercises are those performed by soldiers in camp, in military sports. Pleth-running—where a man runs on the campus from end to end (a sixth of a stadium), to and fro, lessening the distance each time until finally he comes to stand in the middle. Combat with one's shadow. Exercise with the leatherbag [which is filled with flour or sand, and hung to the level of the person's navel ; then pushing it forwards as far as it will go, the athlete runs rapidly backwards to escape its recoil : Oribasius]. Long jumping. High jumping. Play with a large ball [inflated skins or leather]. Play with a small wooden ball on horseback [i.e., polo].

> "He took the bat from the Sage and grasped it firmly ; then, mounting steed, he drove the ball before him and galloped after it till he reached it, when he struck it with all his might, his palm gripping the bat-handle the while ; and he ceased not malling the ball till his hand waxed moist and his skin, perspiring, imbibed the medicine from the wood." (Night 4, Burton i. 42).

Stone-throwing. Lifting heavy stones or weights, either while standing, or carrying them. Cricket (tibtab). [Scaling ropes. (Aeg.). Digging (Aeg.)]. Running galloping horses round in a circle. [Leaping with a weight on the shoulders, which exercises the spine : Galen.]

740. There are various forms of *wrestling*. For instance, in one form, one of the wrestlers grasps the other and holds him by the tips of the hands. The other tries to get loose from his opponent. In another, one wrestler grips the right hand of his opponent, and takes the left hand with his left, the two facing one another; then the one raises the other up into the air, and turns him round, sometimes in the bent position, sometimes in the upright position. (See drawing at head of this section.) Again, the two wrestlers may press against one another breast to breast. Again, one holds the other by the neck to pull him to the ground. Or, one may twist and press with his feet, twisting his legs round his opponent, or turn heel to heel. Various other movements of that kind are in vogue among wrestlers.

Exercises involving swiftness. Interchanging places with a partner as swiftly as possible, each jumping to and fro, either in time [to music] or irregularly. Another exercise is carried out with two stakes. The man jumps backwards repeatedly without moving his position, and plunges the two stakes on either side, one pace apart, causing the one on the right to go to the left, and the one on the left to go to the right. This is to be done as swiftly as possible.

Exercises involving vigour and swiftness should alternate with mild exercises, or with rest. The manner of the exercises should also be diversified, so that they are not always performed in the same way.

741. *There is an exercise which is appropriate for each individual.* Gentle exercise (e.g., swinging : rocking in a swing) is beneficial for those who are debilitated by fevers, and are convalescent, and can neither walk nor sit. Also for those weakened by a draught of hellebore and the like. Also for those whose diaphragm has been rendered enfeebled by disease. When it is done gently, it tends to induce sleep, and disperse flatulence, relieves various disorders of the head (e.g., stupor, forgetfulness)—provokes the appetite, and favours movement of the bowels.

To ride in a litter [horse, camel, palanquin, etc.] is appropriate for those afflicted with semitertian fever, composite fevers, phlegmatic fevers, those who are dropsical, or have gouty pain, or renal disorder. For this form of exercise renders (effete) matter in a condition favourable for excretion, and may be made gentle for the feeble, more vigorous for the more vigorous. Greater movement is produced in the humours by riding in a carriage, but when doing so one should face backwards, because this is better when the eyesight is weak, and it is an advantage to have the shadow in one's face.

Fishing.—The absence of mental and bodily excitement is good for certain conditions (Aetius).

Boating and Sailing.—To go out in a small boat, or in a larger sailing vessel is beneficial for lepra, dropsy, apoplexy, dilatation of the stomach and coldness of the stomach. For if the person is near the shore he is incited to vomit, and then when that subsides, the stomach is benefited. But to go on the high seas is more efficient for clearing up such disorders as we have named, because the mind is diverted by successive gladness and misery, and the organs of nutrition receive benefit in proportion to the exercise of the body itself.

742. Each member should be exercised in a manner appropriate for itself. (i) *The hands and feet.* The proper way to exercise these is obvious. (ii) *The organs of respiration*, and the muscles of the chest. These may be exercised in various ways. (*a*) By singing and "vociferation." The voice is sometimes deep, sometimes loud, sometimes abrupt, sometimes used in all modes in one exercise. By this means the condition of the mouth, uvula, lips, tongue is improved. The muscles of the neck are improved in appearance. The colour of the skin is improved. The chest is expanded. (*b*) Exercises in which the expiration is forced and the breath is held. [i.e., the so-called Yogi exercises.] These benefit the whole body, because they open up and purify the channels, including those of the breath.

As shown in § 123, 144, the channels here referred to are not necessarily the anatomical and histological ones.

Aetius adds that such exercises attenuate the blood.

However, to use a loud voice for a long time is injurious because by continuing it vigorously too much air is taken in, which is itself harmful, and by continuing it too long, air must be expelled unduly, and this also is harmful. Therefore the rule is to begin gently, by reading aloud, speaking more and more loudly up to a certain point and then allowing the voice to sink by degrees. If the time occupied in this exercise is moderate, it is very helpful, but if the time is too long, there is risk of injury to health.

[Reading aloud in a high tone helps to remove redundant humours through the skin. Reading in a moderate tone helps the insensible perspiration throughout the body, attenuates effete matters, and gets rid of saliva, mucus and phlegm by coughing. Frigid people should read aloud frequently because of its warming effect. This method of exercise requires control and judicious management if the system is full of depraved humours, or if the stomach is loaded with crudities, because otherwise noxious gaseous substances are distributed all over the body.

Ritual : First empty the bowels ; then anoint the body ; then sponge the face and lower parts with water. The tone of the voice should be moderate at first, and the person should walk about while speaking. Then a louder tone should be used, and verses should be repeated several times (Aeg.).]

(iii) *Vision* is exercised by inspecting minute objects, and sometimes by arranging that they are only poorly illuminated.

(iv) *Audition* is exercised by listening to faint sounds, or sometimes to loud ones.

(v) Exercises appropriate to each individual member will be referred to when we speak of the maintenance of the health of each organ in the special volume.

Among the modern books which describe suitable exercises of the above kinds, that by Eustace Miles may be here noted (see Bibliography).[133]

743. Whatever the exercise, one must ensure that its vigour or heating effect is not likely to affect some weak member directly. Such a member should only bear the brunt of the exercise secondarily. For instance, a person with varicose veins should not use an exercise in which the feet are much used. He should substitute an exercise which employs the upper parts of the body—the neck, the head, and the hands. In this way the brunt of the effect of the exercise is borne first by the upper parts, and by the feet last.

The exercise must be modified if the person is debilitated. If he is robust it should be made vigorous.

You realize now that every member has its own peculiar form of exercise. That the exercise for the eye is to gaze upon something delicate ; that the exercise to strengthen and expand the chest is vocal, and consists of graduated singing exercises. Similarly with the teeth and the ear. Every member is considered in this way in the chapter specially devoted to it.*

* This and other references in the original text are retained, though actually the subsequent volumes of the Canon are not dealt with in the present treatise.

3. THE BEST TIME FOR COMMENCING EXERCISES. THE PROPER DURATION, AND OTHER RULES.

744. The time to choose for beginning exercise is when the body is free from impurities in the internal organs and blood-vessels, so that there is no risk of unhealthy chyme being dispersed through the body by the exercise. Yesterday's food should have passed both gastric and hepatic digestion, and also intravascular digestion,—the time for the next meal now approaching, as can be ascertained by examining the urine as to its substance and colour.

§ 243. The urinary signs of the proper time for undertaking exercise are specified in Aegineta.—The urine should be deep yellow, because this shows that the digestion has long-since been completed. If the urine is moderately pale, it shows that the digestion has only just been completed. An evacuation of the bowels is here indicated. If the urine be watery, it shows that there is still some undigested chyme in the stomach.

If it is some time before the next meal is due, and there is a need for more nutriment, and the urine shows " igneity " (i.e., is high-coloured), the natural yellowness having now passed off, it indicates that exercise at this time would be detrimental, namely by exhausting the strength.

For this reason, some people say that when vigorous exercise has to be undertaken, it is best that the stomach should not be quite empty : that there should still be a little food, and that this should be substantial in winter, and light in summer.

Moreover, it is better to choose a time for exercise when one is not hungry, and when one is hot and moist rather than cold and dry. But the best time is when the state is between the two. Exercise in a man of hot and dry temperament may lead to illness, and he will benefit by avoiding it at such a time.

745. It is necessary, then, for a person who is about to take exercise that he should first get rid of the effete matters of the body by way of the intestines and bladder. Should friction be used in preparation for exercise, with the object of helping the bowels and opening the pores of the skin, it should be carried out with a rough towel, and be followed by inunction with sweet (perfumed) oil made warm by being held in the hollow of the palm. This inunction is done according to rule until the limbs show a florid blush ; the massaging should not be too forcible, nor the penetration too great. It is done with the hands, which pass over many various positions in order to ensure that every part of the muscular system has been dealt with. When completed, the massage is stopped and exercise may begin.

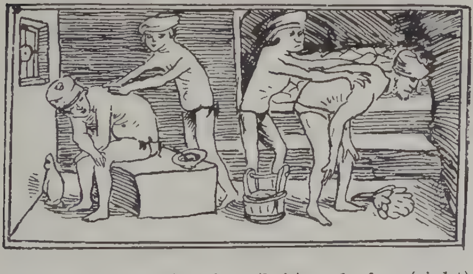
746. *Relation to seasons.* In spring, the best time for exercise is round midday, and it should be done in a moderately warm room. In summer, the exercise should be done earlier. In winter, it should be delayed till vespers, but there are other objections to doing so. Consequently, in winter, the place used should be made moderately warm, to enable the exercise to be carried out at a time when the aliment is digested and the effete matters have been expelled.

747. *Amount of exercise.* Three things must be taken into consideration. (1) The colour. As long as the skin goes on becoming florid, the exercise may be continued. After it ceases to do so, the exercise must be discontinued. (2) Movement. Exercise may be continued as long as the movement is moderated. (3) The condition of the members. Exercise must not be continued after they show any puffiness. Should the insensible perspiration lessen and the visible sweating stop, the exercise must stop. Should the action of the skin have ceased, one applies a strongly-diaphoretic oil as an inunction, especially if the exercise were one which exerted the breathing. (Restorative friction and massage will be needed : Aeg.)

748. At the conclusion of the first day's exercise, you will know the degree of exercise allowable ; and when you know the amount of nourishment the person can bear, do not make any change in either on the second day. Arrange that the measure of aliment, and the amount of exercise shall not exceed the limit ascertained on the first day.

4. FRICTION. MASSAGE. SHAMPOOING

> "Abu Sir came to him and rubbed his body with the bag-gloves, peeling from his skin dirt-rolls like lamp-wick, and showing them to the King, who rejoiced therein . . . after which thorough washing, Abu Sir mingled rose-water with the water of the tank, and the King went down therein. When he came forth, his body was refreshed, and he felt a lightness and liveliness such as he had never known in his life." (Night 935). (Burton, v. 488).



Friction (massage) before (left) and after (right) the bath. From a woodcut of date 1533 (Martin[52], p. 171).

749. *Varieties.* (*a*) Hard Friction: this stretches and contracts, and braces the body. (*b*) Soft Friction has a relaxing effect. (*c*) Repeated friction diminishes the fat of the body. (*d*) Moderately hard friction increases the bulk of the body.

Combination of these will give nine varieties [" much and hard, much and soft, much and moderate ; little and hard, little and soft, little and moderate ; moderate and hard, moderate and soft, moderate and moderately hard " (Aegineta).]

(*e*) Rough friction. This is done with rough towels. It draws the blood rapidly to the surface. (*f*) Gentle friction. This is done with the palm or with soft towels. It draws the blood together and retains it in one member.

The *object of friction* is to render thin persons heavier, and heavy persons thinner ; to brace flabby persons, and to modify those who are not pliable enough (giving tone to the body).

(*g*) Friction as a preparatory to athletics. The friction begins gently, and then becomes more vigorous as the time approaches for the exercise.

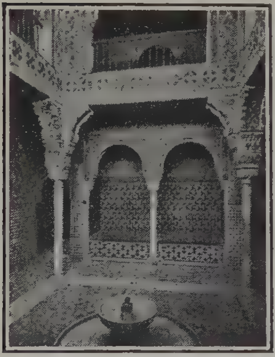
(*h*) Friction as a sequel to athletics—Restorative friction. This produces repose. Its object is to disperse the effete matter formed in the muscles and not expelled by the exercise. It causes them to disperse and so removes fatigue [the feeling of lassitude]. Such friction is soft and gentle, and is best done with oil [or perfumed ointments : Aeg.]. It must not be hard, or heavy, or rough, because that would roughen the members. Young men would be hindered in growth. But for adults it is less harmful.

750. It is less detrimental to err on the side of hardness than on that of softness, because it is easier to correct undue dispersal [of effete matters] than to prepare the tissues (by soft friction) for the reception of effete substances. On the other hand, hard and rough friction to an excess in youths is a hindrance to their growth.

You will learn about this under the heading of "the proper time for friction." For the present it will suffice to say that restorative friction should be begun vigorously at first, and with oil ; that then it should be moderated, but not stopped, until all roughness has gone. It is best that many persons should do it together. The person, having been rubbed, now stretches out his massaged limbs to help to expel the effete matters from them, and a broad bandage or binder is applied over the regions to which the muscles concerned belong. He should hold his breath as long as he can, while relaxing his abdominal muscles ; he should at the same time make his thoracic muscles tense, if he can. Finally, he makes his abdominal muscles tense again. In this way the intestines are given a certain amount of restorative friction. One may pause to take breath between the exercises ; or sometimes restorative massage may be given in the middle of the exercise. Thus, it may be omitted or resorted to, according to whether the exercise is to be prolonged or not. A person who desires restorative friction does not need much preliminary friction, unless there is something about his condition with which he is not satisfied. If he does not desire restorative friction he will undergo more thorough preliminary friction. If fatigue should be experienced, inunction with oil will be employed, as we have stated. If he should experience a sense of dryness, the friction will be increased until the natural mean condition is attained.

Friction without massage (compression) is beneficial if sleep is due, because it cheers the body and prevents humid matters from flowing into the joints.

5. On Various Uses of the Hot Bath



751. For the type of person whose regimen we are discussing, a bath which induces resolution is not required, because his body is inwardly pure. A person does not need the bath except in order to derive a gentle warmth from it, and a moderate amount of moisture. That is why such persons should not stay long in it.

If such persons employ a full-length (copper) bath, they should stay in it only until the colour of the skin becomes red, and the skin becomes puffy ; they should leave it as soon as dispersal (of humours) begins. The surrounding air should be moistened by a sweet-water spray. The actual washing should now be quick and the bath left quickly.

A person should not go into the bath immediately after exercise. He should rest properly first.

752. The forms of bath have already been referred to, and are dealt with again in another place. At this point we should state that all who propose to bathe should pass through the successive rooms of the bath-house according to rule, and not linger in the hot room long enough to cause harm; they should stay long enough in the rest-room* to give time for the dispersal of the effete substances, otherwise there is a risk of weakness which will interfere with alimentation and leave a susceptibility to the causes of septic fevers.

* The inset depicts the interior of the rest-room of the Sultan's private baths at the Alhambra Palace.

753. A person who wishes to become stout should take his bath after a meal, if he is not likely to develop obstructions in consequence. If he is of hot temperament, he may guard against the formation of obstructions by drinking oxymel. If he is of cold temperament, he should take pennyroyal and capsicum.

If it is desired to reduce fat, and to procure the resolution of the humours, the person should bathe while fasting, and stay a long time in the bath.

754. *Precautions regarding food and drink.* To ensure against impairment of health the bather should wait till after the gastric and hepatic digestions are both completed.

Where there is any risk of the bilious humour undergoing fermentative decomposition, and one wishes to bathe fasting, the aliment should be attenuant. But a person of hot temperament, in whom the bilious humour is plentiful, should not enter the hot chamber at all. The best things for such persons to take are : bread soaked with the juice of fruits or rose-water. Cold drinks should not be taken either while in the bath or when leaving it, for the pores are now open, and coldness would speedily enter and pass towards the principal organs and damage their functional capacity. Articles which are very heating (" hot ") should also be avoided, especially water—because thereby there is a risk of the warmth penetrating rapidly to the principal organs and this predisposes to wasting and hectic. Further, such persons should take care not to leave the bath suddenly, or to uncover the head, thus exposing the body to cold. If it is winter, the body should be well covered with towels.

755. A person suffering from fever should avoid the bath at the febrile period. The same applies to a person suffering from any form of loss of continuity, or from inflammation.

756. From the above, therefore, it will be clear to you that baths have the following effects : warming, cooling, humectant, desiccant, beneficial, harmful.

Beneficial effects : the induction of sleep ; aperient action ; abstergent action ; resolvent action ; digestive ; drawing nutriment to the surface of the skin. But the resolvent effect only occurs if that is desired ; the excretory effect occurs only through the natural channels. Baths are beneficial for constipation and for removing lassitude.

Injurious effects. The heart is weakened if the person stay too long in the bath. The bath produces syncope and nausea, and sets stagnant humours in circulation, and disposes them to undergo putrescence, and to pass down into the weaker members, with consequent inflammatory deposits in both internal and external members.

6. On Ablution with Cold Water

§ 244. It may be noted that ablution with cold water constitutes part of the ritual of Mohammedan prayer, and imparts a sense of cleanliness besides helping to preserve the physical health.

The medicinal use of affusion, cold sponging, and cold packs will be thought of under the present heading.

Whereas hot water is debilitating, cold water is strengthening. The addiction to the hot baths of the Hammans in Turkey has been held by some Mussulman writers to have been detrimental to the virility of the race.

757. This form of ablution is only beneficial if all the proper rules are observed, and if the age of the person, his physique and build, are suitable, and the season* is appropriate (i.e. the summer). The contra-indications are : nausea, or a feeling of satiety associated with indigestion ; vomiting ; or diarrhoea ; or want of sleep ; or nasal catarrh. The person must not be at the age of boyhood, nor at old age. [Therefore he must be in the prime of life.] The moment chosen for the ablution should be one at which the body is light and the movements appropriate.

Ablution with cold water following upon one with hot water.—The object of this is to make the external parts stronger, and to retain the natural heat. For this purpose the water used should not be very cold, but of a medium temperature.

758. Ablution with cold water after exercise.—Here the preparatory friction should be more vigorous than usual. The customary inunction with oil is employed as well before the exercise, which must be less vigorous than usual. The exercise completed, the person plunges into the cold water tank, so as to harden all the members at once. He stays in the cold water in proportion to his lightness, and as long as he can without shivering ensuing. Then, having come out of the water, let him be rubbed as we have described (i.e. till the skin is red), and let him take more food than drink. The time which elapses before the natural colour returns to the skin must be noted, because if the colour returns rapidly, the duration of the cold bath was reasonable, whereas if there is delay, it shows that the stay in the water was too prolonged. In this way the person will know the proper duration of the bath for the future.

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* It has been a widespread belief that the atmosphere in springtime affects open waters, so that it was healing and strengthening to bathe out of doors at this time. (Martin,[52], p. 11).

Should the person wish to re-enter the water after the friction, and after regaining his colour and normal heat, he must on this occasion enter the water gradually, and on a hot summer's day before the hottest part of the day, and when no wind is blowing. He must not do so when in a state of lassitude after coitus, or after a meal which has not had time to digest, or after emesis, or after evacuation of the bowels, or after gastro-enteritis, or insomnia, or if the body or stomach be enfeebled.

Cold bathing should not be done after exercise except in the case of the very robust. Even then the rules which we have given should be followed. To use cold baths in the ways we have named drives the natural heat suddenly into the interior parts, and then invigorates the strength, so that the person should leave the bath twice as strong as when he entered.

§ 245.—*Sea-bathing.*—Modern advice follows the same rules as above. Namely, do not enter the sea too soon after a meal, or if not feeling quite fit. There is otherwise a risk of cramp. The sea should not be entered in the early morning unless one is very healthy.—To enter the sea too often in the day (more than twice) has a decidedly weakening effect. The best time to bathe in the sea is the warm afternoon, two hours after a meal. The proper thing to do after the bathing is to rest—not to run about on the sands. (Remember sharks.)

7. The Regimen in regard to Food and Drink

(Comestibles and Potables.)

"The stomach is the house of disease and diet is the head of healing; for the origin of all sickness is indigestion, that is to say, corruption of the meat in the stomach" (Night 452).

§ 246-—*Meal-times.*—Burton (vi. 111) mentions "breakfast" (Arab. fuṭūr) which is eaten immediately after the dawn-prayer, except in Ramazan. This is a substantial meal of bread and boiled beans, eggs, cheese, curded milk and the pastry called faṭirah, followed by coffee and a pipe.—Lane[159] (i. 169) mentions "dinner" as being taken after the noon-prayer, and states that a single meal may be taken before noon instead of these two meals. The principal meal is supper, which is taken after the sunset prayers.

759. In seeking to maintain health care must be taken that the essential basis of the meal is not in medicinal nutrients like potherbs, fruits, and such-like. For things which are tenuous in character over-oxidize the blood, and those which are dense render the blood phlegmatic, and the body heavy.

The meal should include: (1) flesh, especially kid of goats, veal, and year-old lamb ; (2) wheat, which is cleaned of extraneous matter, and gathered during a healthy harvest without ever having been exposed to injurious influences ; (3) sweets of appropriate temperament ; (4) fragrant wine of good quality. Any other kinds of food can only be regarded as a sort of medicament or preservative.

(Cf. the modern (i) animal protein food ; (2) vegetable proteins ; (3) carbohydrate. Fats and salts complete the list, in place of wine as given above.)

The more nutritious fruits are : figs, grapes (ripe and sweet), dates from countries and regions in which they are indigenous. But if superfluity arises after partaking of these fruits, speedy evacuation should be procured.

760. In winter the food should be hot ; in summer cold or only slightly warm. A food should not be served either hot or cold if it is likely to be spoiled thereby.

761. A person should not eat unless hungry. Nor should he delay his meal until the appetite has passed off. This rule does not apply in the case of the fictitious appetite met with in drunkards, or the subjects of nausea. If fasting be continued, the stomach will fill up with putrescent humours.

Nothing is worse than to eat to repletion during a time of plenty after having been in a state of starvation during a time of famine, and vice versa. But the transition period is the worse. For we often see many people who lack food at a time of famine, and eat to repletion when a fertile year comes, with fatal result. Great repletion is very dangerous in any case, whether in regard to food or to drink. For how often do not people over-eat, and perish from the consequent choking of the channels of the body ?

762. An error in eating or drinking any of the medicinal nutrients is to be corrected according to the digestion and maturation thereof, and the person must be protected from the intemperament which is likely to arise. To effect this, one takes the contrary substance until the digestion is completed. Thus, if the aliment was cold (e.g. cucumber, gourd), temper it with its opposite (e.g. onions, leek). If the aliment was hot, temper it with the opposite (e.g. cucumber, purslane). If the aliment is binding, take some food which will open and evacuate, and then fast for a suitable period. A person in this state—and this is true for all who wish to maintain their health—should not partake of food until there is a definite appetite, and unless the stomach and upper small intestine have emptied themselves of the previous meal. For there is nothing more harmful to the body than to superpose aliment upon incompletely digested food. There is also nothing worse than nauseative indigestion, especially when this is the result of bad foods. For if these are gross, the following symptoms and illnesses arise : pains in the joints, in the kidneys ; dyspnoea, podagra, indurative enlargement of the spleen and liver, illnesses in which the serous or atrabilious humours are concerned. If the foods were attenuated, then acute fevers, malignant fevers, and grave acute inflammatory disturbances would develop.

However, it is sometimes really necessary to give a food or a substance like food, on the top of another food, by way of medicine. For example, if one has taken sharp and salty nutrients, one may further take humectant aliments which have no flavour, before the former have digested completely. The chyme by which the body is nourished is then rectified. This is a suitable measure for cases of this kind, and the use of exercise is not indicated.

The contrary holds good in the case of those who partake of gross foodstuffs and afterwards admix with them something which is speedily digested and acrid in taste.

763. A small amount of movement or *activity after a meal* allows the food to descend to the fundus of the stomach, especially if after this there is a desire to sleep. Mental excitement or emotion ; vigorous exercise ; these hinder digestion.

764. In *winter*, feebly nutrient foods, like pot-herbs, are not to be partaken of. The aliments should be stronger and more solid in texture—such as cereals, legumes, and the like. In summer, the contrary is true.

765. The *quantity of food* taken at a meal.—No meal should be bulky enough to completely satisfy the appetite. One should rise from the table while some appetite or desire for food is still present. For such remnants of hunger will disappear in the course of an hour. Custom is to be regarded in this regard, for a meal is injurious when it brings heaviness to the stomach, and wine is injurious when it exceeds moderation, and swims in the stomach.

If one ate to excess one day, one should fast the next, and a longer sleep should be taken in some place which is neither hot nor cold. If sleep refuse to come, one should take gentle walking exercise and allow neither rest nor recumbent position. A little pure wine should be taken. Rufus says, " Walking after a meal is grateful to me, for it gives a good preparation for the evening meal."

A short sleep after a meal is useful ; one should lie first on the right side, then on the left, and finally turn back again to the right side. If the body be covered with a number of wraps and the neck be raised, this will aid digestion. The limbs should slope downwards and not upwards.

The standard *size of the meal* depends on usage and vigour. A normally robust person should take as much as will not produce a sense of heaviness, or a sense of tightness of the hypochondria. There should be no subsequent rumbling in the stomach, or splashing of the food on bodily movement. Nausea should not be experienced, nor a canine appetite, nor loss of appetite, nor great disinclination for exertion, nor sleeplessness. The taste of the food should not repeat in the eructations. If the taste of food lingers in the mouth a very long time after the meal, it shows that the latter was too heavy.

766. Indications that the meal was moderate : the pulse does not become full ; the breathing does not become shallow. The latter only occurs if the stomach is compressing the diaphragm, thus making the inspirations shallow and short. The pressure to be met by the heart increases after a large meal, and as the force of the heart does not diminish, the pulse becomes large and full.

A person who experiences a sense of heat and flushing after a meal should not take a whole meal at one sitting, but partake of the food in small portions at short intervals to avoid the effects of repletion—such as shivering followed by a sense of heat like that in a sthenic fever. This is due to the heating effect of the food.

A person who cannot digest the amount of food appropriate for him should increase the number of articles of diet, but diminish the quantity.

A person of atrabilious constitution needs a diet which is very humectant but not very heating.

A person of choleric constitution needs a diet which is humectant and infrigidant.

A person who generates hot inflammable blood needs feebly nutritious articles of food, which are cold. One who generates phlegmatic blood needs feebly nutritious articles of diet which are hot and attenuant.

767. The order in which the components of a meal are to be taken.—A person who is desirous of maintaining his health needs to be watchful of this matter. Thus, one should not take a tenuous food, which is rapidly digested, after taking a very nutritious dish which is slowly digested. An exception to this rule has been named above. The reason is that the first article of food will be digested first and therefore float over the other, unable to enter the blood. Consequently it ferments and decomposes, and in addition sets up decomposition of the food next taken. The reverse order, therefore, is the one to adopt, so that the labile food will pass on with the other into the intestine, and then undergo complete digestion.

Fish and similar articles of food should not be taken after laborious work (or exercise), because they undergo decomposition and then decompose the humours.

Some persons may be allowed to eat an article of food in which there is a styptic property as a preparatory to the actual meal.

768. *Idiosyncrasies.* Some persons have an idiosyncrasy of the stomach in which the foods leave it very rapidly, and do not stay in it long enough to undergo gastric digestion. This explains the necessity for taking the idiosyncrasy of the stomach and its temperament, into consideration [along with other factors when drawing up a dietary].

There are some persons in whom tenuous food, instead of being digested quickly as it should, undergoes decomposition in the stomach, whereas less rapidly digestible foods are digested more readily. The stomach of such a person is designated igneous. But other persons are exactly the opposite. Therefore the rules to be given must be adapted to the peculiarity of each (patient).

769. The countries in which people live have also their own natural properties, which are distinct from the ordinary rule. This must also be borne in mind, and a test must be made to ascertain what the rule should be. Thus, a food which is often used, though injurious to a certain degree, may be more appropriate for a given individual than a food which he does not often take, though its character is good.

> "The best food of every people is that which grows where they live: oats—that is, porridge—for Highlanders; wheat for the centre of Europe; rice for the swamps of the Far East; etc. But in these days of easy and quick transport, any foods can be obtained in any part of the world, and peoples are enabled to partake of foods unnatural for them."[123] (p. 1077).

770. Then again, there is a food which is to be regarded as appropriate to everyone's physique and temperament. To change from such a diet would prove injurious and detrimental to him.

Good and laudable foods may be injurious to some. They should therefore avoid them. But persons who are able to digest "bad" foods should not be deceived, because (for all they know) they will some day give rise to bad humours and the consequent obstinate ailments.

Good food may often be allowed liberally in the case of persons in whom the humours are unhealthy, so long as diarrhœa from intestinal weakness does not supervene in consequence. But if the person be of spare habit, and liable to have the motions loose, the diet should consist of moist aliments, because they are digested quickly, even though it is a fact that such persons can tolerate various heavy foods, and are less liable to be affected adversely by intrinsic noxae, and are more susceptible to the antagonistic influence of extraneous noxae.

771. An active person accustomed to take much flesh-meat needs frequent bleeding. A person inclined to be frigid in temperament should drink substances which cleanse the stomach, intestines and the (mesenteric) veins—including confections of spices and myrobalan electuary.

772. It is a bad practice to combine nutrients of diverse character in one meal and so prolong it. For by the time the last portion has entered the stomach, the first portion is already digested, and therefore the various contents of the stomach are not all at the same stage of digestion.

773. *Palatability.* One should remember too that aliment is best which has the most agreeable flavour, for the walls of the stomach and the retentive faculty jointly apply themselves better to a food of good substance, and the efficiency of the retentive power is assisted when the principal members all mutually concur—the temperament of one being not more divergent from that of another than natural. That is the requisite condition. The conditions are not fulfilled, for instance, if the temperaments are not normal, or alike in the respective members. Thus, the temperament of the liver may differ to an unnatural extent from that of the stomach.

Among noxious influences arising from the taste of aliments is that if very gross aliments are tasty, a person may be tempted to eat too freely of them.

774. In taking successive satiating meals, it is best for a person to take only one on one day and two on the next (morning and evening). But one must not be too strict in this rule, for if a person is accustomed to have two meals a day, and then takes only one, he will be weakened and his (digestive) faculty will suffer. A person of weak digestion should take two meals a day, lessening the amount partaken. On occasion he may eat once a day. A person who is accustomed to take one good meal a day will, on resuming the habit of two meals a day, suffer from weakness, lack of energy, slackness. If he should take no food at bedtime, he will feel weak ; and if he should take a late meal he will not be able to digest it, and will have acid eructations, nausea, bitter taste in the mouth, loose bowels and become moody, or irritable. This is because he has put into the stomach something to which it is not accustomed, and so he is liable to show some of the symptoms which befall a person whose aliment is not fully digested.—And these you are now acquainted with.

775. Among the symptoms arising when a person does not take a late meal are : subjective sensations at the cardiac orifice of the stomach, gnawing pains, a sensation of a void in the stomach so that all the interior organs and intestines feel as if they were suspended, and therefore all clumped together. He passes scalding urine, and the faeces produce a burning sensation as they are passed. There may be a feeling of cold in the extremities owing to the bilious humour being poured out into the stomach and irritating it and making it congested. This is more likely in persons of bilious temperament, and in those who have bilious humour in the stomach but not to an undue extent in the rest of the body ; these suffer from loss of sleep, and keep turning over from one side to the other [in bed].

776. Persons then in whom the bilious humour is apt to accumulate in the stomach should take their meals divided, thereby taking the food quickly ; the meal is taken before bathing. In other persons exercise should be taken first, then the bath, and then the meal. The meal should not precede the bath in these cases. If circumstances demand that the meal be taken before the exercise, the food should consist of bread only, and to an amount no greater than can be easily digested. As it is necessary that the exercise should not be gentle if taken *before* food, so it is necessary that the exercise should be mild and gentle if it is taken *after* the meal.

When the appetite is depraved so that it prefers sharp-tasting things to sweet or unctuous things, nothing is better than to procure emesis with such as oxymel with radish after fish.

777. A person who is stout should not eat at once after a bath, but should wait and take a little nap. He is best advised to take only one meal in the day.

778. One should not go to sleep immediately after a meal, with the food still swimming in the stomach, and one should, as much as possible, abstain from much exercise after a meal, lest the food pass into the blood before it is sufficiently digested, or glide out of the stomach without being digested at all, or undergoes decomposition, since the exercise disturbs the gastric temperament.

779. Nor should much water be drunk after a meal, for it causes the food to leave the coats of the stomach and float about. One should wait, and not drink fluids until the food has left the stomach—which is evidenced by the sensation of lightness in the upper part of the abdomen. However, if there were urgent thirst one may take a modicum of cold water through a straw, and the colder it is the less one will require. Such an amount would soothe the stomach and keep the food together.

"Neither drink (water) immediately after leaving the Hammam nor after eating (except it be after the lapse of fifteen minutes for a young man and forty for an old man), nor after waking from sleep" (Night 452).

"If a man wait awhile after eating, and then drink, the drink is sweeter and lighter and more digestible to him than at another time, and there ascends to him a pleasant fragrance and a penetrating," as quoth the poet: "Drink not upon thy food in haste, but wait awhile, else thou with halter shalt thy frame to sickness lead: And patient bear a little thirst from food, then drink." (Night 451; Burton.)

780. To sum up—if a person must drink, it is better only to take so small an amount, at the end of the meal (not during the meal), as will spread over and moisten the food, and therefore not be injurious.

To go to sleep while thirsty, is beneficial to cold and moist temperaments, but is injurious to those in whom the temperament is too warm, because of the bilious humour (being too plentiful). The same is true as regards going to sleep while fasting.

Bilious humour comes to predominate in persons who fast, and therefore flows into the stomach. Therefore when they eat any food it decomposes, and the same symptoms occur in them, whether asleep or awake, as when food corrupts. And, furthermore, there is loss of desire for food.

781. When there is *loss of appetite for food* something needs to be given to counteract this and relax the bowels. For this purpose something mild, like prune, should be given, or something which does not suggest nausea, like a laxative fruit-juice (manna). Meals may be resumed after the appetite has returned. Those whose tissues are moist in virtue of natural humidity are liable to speedy aperient action, and are in consequence not able to fast as long as those whose tissues are dry in virtue of only a small (degree of natural) humidity :—unless the latter should be rich in humidities other than those inherent to the substance of the tissues, for these are proper, good and receptive, and in consequence the natural faculty is able to change them completely into (true) nutriment.

782. To take wine after a meal is very unsatisfactory, for it is rapidly digested and enters the blood quickly and carries food on into the blood before it is properly digested. Obstructions and decompositions [in this imperfectly digested aliment ultimately] arise.

Sweet things readily produce obstructions [in the channels of the body] because the attractive faculty draws them into the blood before they have been properly digested. Obstructions culminate in various diseases, of which dropsy is one.

Heaviness of the air or water, especially that of summertime, favours the decomposition of food. In this case, then, it is not harmful to take a tempered wine after a meal, or hot water in which xylaloes and mastic have been boiled.

783. If a person whose alimentary tract is " hot " and strong, should eat *heavy food*, it will give rise to flatulence in the stomach and fermentative ailments.

When a person takes a *tenuous* article of *food* upon an empty stomach, the latter contracts on it, and if he then takes something heavy, the stomach abandons the tenuous food and ceases digesting it, and it undergoes putrescence in consequence. This would be avoided by allowing an interval of time to elapse between the two kinds of food. Under these circumstances it is best to take the heavy food slowly, because then the hold which the stomach has on the tenuous food is not broken.

§ 247. The principle is that the food should be *held* close to the mucous membrane all the time. This is what is done by the " attractive faculty." The stomach " holds " the food close to its mucosa as a mother holds the babe to her breast ; the pylorus keeps tightly closed until it is time for the gastric contents to pass on, on the same principle as applies in the case of the os uteri, which does not open until it is time for the uterus to evacuate itself ; or in the case of the bile-papilla, which remains tight until the time comes for bile to be passed into the duodenum. The gall-bladder also keeps (tonically and) accurately applied to its contents in a similar way. In each case the retentive faculty operates until the expulsive faculty is called upon, and vice versa. Modern physiology regards it all as mechanical, comparing everything to the test-tube experiments ; but it is actually *vital*—one might almost say purposive—it is as much purposive as the grasp with which the coelenterate holds its prey.

Once a gap is allowed to intervene between the food " attracted " or grasped by the mucosa, then digestion stops and the food particles clump up and swim about in bits in the fluid, and then putrefy. One might picture the normal process as one of apposition to the mucosa as the limpet shell is affixed to the rock ; that fluid may be allowed to separate off the film of food from the mucosa by mismanagement, and that when it does so at one spot, the whole film will peel off, and folds up or breaks up. Once this has done it is hopeless to restore it again to its previous position, and " indigestion " is definitely the fate of that meal.

784. When a state of over-repletion exists in regard to some meal, whether as a result of exercise (which causes undue hunger), or because a draught has been taken as well, then there will be a need for rapid emesis. If this should fail, or one cannot vomit, the person should sip hot water until the repletion is displaced and sleep supervenes. The person should therefore lie down and (compose himself to) sleep. Let him sleep as long as he will.—But should this not suffice, or should he be unable to go to sleep, reflect whether the natural course of events is likely to save you from procuring emesis. If so, good. If not, assist the natural power by any gentle laxative, such as myrobalan electuary, confection of roses, or origanum prepared with sugar or honey ; or by the use of such things as cumin, spiced candies, asphodel and cabbage ptisan.

It is not as bad to be repleted with wine as with solid food.

785. Among the (aperient) remedies which are suitable after food are : aloes to the bulk of three chick-peas ; or half a drachm of aloes, half a drachm of mastic, and a sixth of a dram of nitre. Mild remedies are : turpentine resin to the amount of two or three chick-peas ; nitre in equal quantity, or less, if necessary. Another much praised remedy is to use an epitheme with wine (**821**, **839**).

If none of these remedies succeed, let the patient sleep for a long time, and abstain from food for a whole day. Then, if he feels better, let him bathe, and place a hot blanket over the abdomen, and see that the aliments are tenuous.

If the food is still not properly digested, in spite of all these measures, and heaviness, distension, and lack of energy are experienced, you may know that the veins are already overcharged with effete matters. Bulky and unneeded nutriment, even were it digested in the stomach, would hardly undergo the proper changes in the veins, and so would remain " crude " within them, and stretch them, even to bursting point. This is the explanation of the lack of energy, the heaviness, the desire to stretch oneself and the yawnings. The treatment in such a case consists in securing the release of the superfluities from the blood vessels.

If these are not the symptoms, but there is only a transient weariness, followed later by another form of weariness, this should be treated in the manner to be described.

786. If a person should be very advanced in years, and his body does not derive as much benefit from the food as it did when he was young, and if his aliments become simply effete matters, then he should not eat as much as he used to do.

787. If a person is accustomed to a heavy diet and then lightens it by the use of attenuant foods, the new food material is unable to keep the channels (of the body) as full as before. So, on resuming the heavy foods, obstructions are brought about.

788. *Heating foods.* The injurious effects of heating or calefacient foods can be corrected by the use of syrup containing acetic acid, especially when made with seeds, for then the syrup is more efficient. If honey is used however, the simple syrup will suffice. The injurious effect of " cold " foods is corrected by the use of hydromel, and its syrup, and caraway.

789. *Heavy and Light Foods.* To correct aliments which are heavy, a person having a hot temperament should use acetous syrup made of strong seeds ; a person with a cold temperament should use a little capsicum or peppermint.

Tenuous foods are better for the health, but less valuable for the vegetative faculties and strength. Heavy foods have the opposite value. Hence, for a person in need of a tonic, aliments which make strong chyme are necessary, and such as antagonize the hunger-feeling. But they should not be taken in greater quantity than can be digested. Heavy foods are better borne by those who take plenty of exercise or are accustomed to heavy work. Probably the deep sleep which this favours helps the digestion. But on the other hand they lose much by sweating. And as their livers seize whatever of the aliment has not yet digested fully, this paves the way for fatal illnesses towards the end of life, or at the beginning of life, the more so because they trust in their digestive powers too much. This power is really due to the deep sleep which is customary, and that is lost by old age.

790. *Fruit.* Fresh fruit is only good for those who carry out hard work, or take much exercise, or for persons with plenty of bilious humour, or during the height of summer. Fruit should be taken before a meal,—namely, for instance, chrysomela, mulberries, melons, peaches, and prunes. But it is better to regulate oneself by using other articles of food than these, for they render the blood too watery, and so it is apt to ferment.

Hence the juices of fruits, unless taken at a seasonable time, pave the way for putrefactive processes. So, too, any food which comes to burden the blood with "crude" humour has this effect, though it is true that sometimes such a food may be beneficial (e.g., cucumber ; c. anguinalis). That is why people who make use of such aliments, even though they are primarily infrigidant, are likely to develop febrile diseases.

You will also realize that it is when watery humour is not dispersed, but lingers in the blood-vessels, that it usually becomes toxic. However, when exercise is taken before such aquosities have become aggregated, and exercise is taken immediately after eating the fruit, these aquosities will disperse and the noxious effect of the fruits is thereby lessened.

Note too that the presence of "crude" serous humour or of wateriness in the blood prevents the nutrient part of the food from adhering to the tissues, some of the nutritive value of the food being lost in consequence.

A person who partakes of fruit must (therefore) take walking exercise afterwards, and then eat something which will cause the (aquosities) to flow out.

791. Aliments which give rise to (1) wateriness ; (2) "crude," raw, immature humour ; (3) gross humour, and bilious humour, give rise to febrile diseases. This is because (1) the watery parts permit putrescence to occur in the blood ; (2) viscous gross substances close the orifices (of the juice-canals) ; and (3) the (increase of) bilious humour adds to the heat of the body, and renders the blood sharp.

Bitter pot-herbs are sometimes very advantageous in winter-time, just as tasteless herbs are beneficial in summer-time.

792. *Correctives of unwholesome foods.* If a person is bound to partake of unwholesome aliments, he should do so seldom and sparingly, and should counteract their action by combining with them something of contrary effect. Thus, if a certain sweet food is injurious, he may counteract it by a sour aliment like vinegar, and pomegranate, and an acetous syrup prepared with sour wine and quince and the like, and also by procuring evacuation. Should it be a sour aliment that is injurious to him, he may follow it up with honey, or old wine, taking this before the maturation and digestion of the former are complete. If it be an oily aliment that is injurious, this can be corrected by (*a*) pungent articles, like chestnut, myrtle-seeds, carob bean of Syria, the fruit of the sidr tree, medlar ; (*b*) bitters, such as conserved elecampane ; (*c*) salt and sharp substances, like capers, onions, garlic [that is, articles usually belonging to the second course of a meal], and other contraries.

793. If the body is in a state of repletion by unhealthy humours, this state may be counteracted by a liberal allowance of commendable attenuant aliments. If the body is one which is easily purged, moist and easily digested food should be made use of.

Galen says that a humid article of food is nutrient when it is separated from all other qualities, and is as it were tasteless —being neither sweet nor sour, bitter nor acrid, pungent nor salt.

794. A heavy food which is divided up into small portions will be better borne than one which is taken solid.

If dry aliments be taken plentifully, the strength will fail and the colour will fade, and the " nature " become dry.

Fatty food produces lack of energy and vim, and creates a false appetite. " Cold " food produces lack of vim and is infrigidative (or, attenuant). Sour food has the same effect as old age ; it dries the body and makes it lean. Sharp and salt food is injurious to the stomach. Salt food is bad for the eyesight.

If an appropriate aliment is oily, and is followed by an uncommendable aliment, the latter will decompose it.

Viscous aliment experiences delay in passing through the intestine. Citrul [a species of cucumber] passes down the intestine more rapidly if the rind is taken as well than if first peeled. Bread also passes down more quickly if the crust be taken as well than if it be deprived thereof by crumbling it through a sieve.

If a fatigued person, who is accustomed to a mild regimen, should take heavy foods—as for instance, a dish of rice with soured milk—after a long fast, it will come about that his blood becomes sharp in quality and as if ebullient. Hence reducing regimen would be indicated (e.g., blood-letting), though only to a moderate extent. A similar remedy is applicable when a person is angry.*

Note too, that sweet aliment accelerates the " nature " before the food is matured and digested, and the blood is tainted in consequence.

795. *Incompatibilities between foods.* Certain rules must be noted in regard to combining various articles of food. Indian observers and others have long taught that (1) milk must not be taken with sour foods ; (2) fish must not be taken with milk—

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* Quick-tempered ; the bilious humour easily becomes dominant or astir.

for in that case chronic ailments such as leprosy[*] may develop; (3) Pulse must not be taken with cheese or radishes or with the flesh of flying birds; (4) a polenta[†] of barley-meal should not follow on a dish of rice made with soured milk[‡]; (5) eatables should not have oil added, or oil which has stood in a brass vessel; (6) fleshmeat should not be taken when it has been roasted over live coals (with certain herbs).

796. *Courses of a meal.* To have several courses to a meal is injurious in two directions: (*a*) the rate of digestion is diverse, for the part that digests more speedily is admixed with a part which is not yet digested; (*b*) a person may eat too much of one dish. Already in ancient times, too, persons who had been exercising themselves avoided this error, being satisfied to partake of meat alone in the morning, and bread alone at supper-time.

During the summer it is best to take the (main) meal at an hour when the temperature is cooler.

During a period of fasting the stomach sometimes fills with unhealthy humours.

Note further that when meat is roasted, and taken with onions and eggs [a special recipe 'kabāb'[§]], it is very nutritious; but it is slow in passing through the intestines, and lingers in the caecum. White soup [a Syrian dish containing rice, honey, onions] is nourishing, and when onion is added it dispels flatulencies; if onions are omitted, borborygmi arise.

Some people consider that grapes are good to take after roasted meats; but the contrary is really the case; they are very bad indeed. So too, is a dish containing dates, figs, and the like. But (dry) pomegranate seeds are good.

Fowl.—The flesh of partridge is dry and constipating; but that of chicken is moist and relaxing to the bowels. Roast fowls are better if they have been prepared (stuffed) in the belly of a kid or lamb (see § 251) because that preserves their moisture. Chicken-broth tempers the humours strongly; more so than fowl-broth, though the latter is more nutritious.

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[*] Two kinds of leprosy are distinguished by the Arabs:—baras and juzām. The former is "white," and the other "black." The latter is leprosy of the joints. Both are ascribed to dietetic errors, especially fish-eating. and milk-drinking. (Burton, iii. 370). The term used in the present passage is juzām.

[†] Polenta = sawīq = ptisane (Lane). This is native frumenty and green grain (mostly barley), toasted, powdered, mixed with dates or sugar, and eaten on journeys when cooking is impracticable. It is carried in a meal-sac (Burton, iv. 491).

[‡] Soured milk. This is milk artificially soured. It is eaten with rice, and is a component of salātah, cucumber salad. (Burton, iv. 132; who adds, "all nomads who live on milk never take it fresh.")

[§] Kabāb. This is mutton or lamb cut into small squares and grilled on skewers. It is the equivalent of our "roast meat." (Burton, iv. 154).

Kid of the goats is better when cold than when warm because the steam quiesces it. The flesh of lamb is better when hot because its unsatisfactory odour is thereby dispersed.

Meat boiled in water and vinegar [a Persian dish] should be served hot, and then needs no saffron in it. But if served cold saffron must be introduced.

Honey confections may be made with dates or wheat flour (sweetmeats) ; but they are unhealthy because they cause obstructions and evoke thirst.

Bread is an unsatisfactory food when it does not digest, more so than (flesh-food) when it does not digest.

8. RULES CONCERNING THE USE OF WATER AND WINES.

797. WATER* is more suitable for attempered constitutions when it is moderately cold, than when it has been cooled by the addition of snow, especially if the snow were not pure. Even with good snow, there remains the objection that that which passes out from it is harmful to the nerves and the organs of respiration and all the internal organs. Moreover a person cannot tolerate it unless he is very full-blooded, and it will do harm sooner or later, even after the lapse of years.

Certain empirics assert that one must not mingle well-water with river-water, except by taking the one after the other has passed out of the stomach.

We have already spoken about the properties and choice of waters and how to correct them when bad. Addition with vinegar rectifies unhealthy waters.

798. *True and False Thirst.* One should remember that it is very harmful to drink water while fasting, or after exercise, or after the bath, especially when either of these was carried out on an empty stomach. It is also harmful to gratify the false thirst of the night, like that from which drunkards or topers suffer, or when the vegetative power strives to accomplish digestion in the face of a preceding satiety with water. If the thirst be very urgent, the water should be such as has been exposed to cool air, and rinse out the mouth with cold water. If this is not effective, some water may be taken out of a vessel with a narrow mouth. This is sometimes agreeable to a toper, who would not be hurt by drinking while fasting. If a person cannot avoid drinking while fasting, let him take water ; especially if he has been taking exercise. In this case, let him first drink wine diluted with hot water.

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* "The usual beverage at meals is water, which is drunk from cooling, porous, earthen bottles, or from cups of brass or other metal. The sherbet is composed of water made very sweet with sugar, or with a hard conserve of violets, or roses, or mulberries, etc." (Lane).[159]

A delicious sherbet is made of a conserve of sugar and violet-flowers.

False thirst is relieved by going to sleep without quenching it with fluid. For during sleep the natural power disperses the matter which is the cause of the thirst, and it does this more effectively if the thirst was not yielded to by a draught. To attempt to allay false thirst by a draught is to interrupt the digestive power, and the false thirst will return later because the humour giving rise to it is still there. When there is false thirst, water should not be taken rapidly and greedily, but through a straw.

799. It is bad to drink much cold water. If it is very imperative to do so, defer it till after a sufficient meal.

Tepid water evokes nausea. Water warmer than that, if drunk frequently, weakens the [tone of the] stomach. But when taken infrequently, it washes out the stomach and opens the bowels.

WINE.

Lane[159] describes as the usual "wine" a preparation made by using dry grapes or dry dates in water to extract their sweetness ; this is allowed to ferment slightly until it acquires a little sharpness or pungency. It was not kept after the third day. (i, 293).

Wine at parties was rather thick, and required straining before use. This was because the wine was cured in vessels whose interior had been coated with pitch (ib. p. 299.)

Virtues of Wine.—"As to the advantages that be in wine—it strengtheneth the viscera and banisheth care, and moveth to generosity and preserveth health and digestion ; it conserveth the body, expelleth disease from the joints, purifieth the frame of corrupt humours, engendereth cheerfulness, gladdeneth the heart of man and keepeth up the natural heat ; it enforceth the liver and removeth obstructions, reddeneth the cheeks, cleareth the brain and deferreth grey hairs." (Night 452 : Burton).

800. White light wine is best for those who are in a heated state, for it does not cause headache. But sometimes it is humectant. It may relieve a headache when that is due to heat in the stomach.

Instead of a light white wine, one may use a wine which has been clarified by infusing honey or bread in it, especially if this is done two hours before the wine is required.

Heavy wine, if it is sweet, is best for a person who wants to put on weight and become strong. But he must beware of developing obstructions. Old red wine is best for a person of cold phlegmatic constitution.

801. It is bad to drink wine after any of the various dishes, for the reason we have already explained. It should not be taken till after digestion, the food having passed into the small intestine. To drink wine upon food forming bad chyme, either during the meal or before it has digested, is bad because it causes the bad chyme to be absorbed and pass into the remote parts of the body. The same is true if wine is taken after fruit, especially melons.

It is better to begin with a small amount than a large one. To take two or even three glassfuls [$=\frac{3}{4}$ pint, according to Lane] upon a meal is not hurtful to anyone accustomed thereto, or to a healthy person who has been bled.

802. Wine is beneficial for persons with a predominance of bilious humour, because it gets rid of the excess of this by provoking the urine. It is good for persons of humid temperament because it brings humidities to maturity. The better its aroma (bouquet) and taste, the more beneficial.

Wine is also very efficient in causing the products of digestion to become disseminated through the body. It "cuts" phlegm and disperses it. It separates off the bilious humour and draws it on into the urine. It renders the atrabilious humours more mobile and able to leave the system. It counteracts the harmful influence of this atrabilious humour by contrariety, and it breaks up all entanglements without the necessity of extraneous heat.

The varieties of wine have been already enumerated in the proper place.

803. Wine does not readily inebriate a person of vigorous brain, for the brain is then not susceptible to ascending harmful gaseous products nor does it take up heat from the wine to any degree beyond what is expedient. Therefore it renders his mental power clearer than before; other talents are not affected in such an advantageous manner. The effect is different on persons who are not of this calibre.

A person who is weak in the chest, to the extent that wintertime is trying to the breathing, cannot [wisely] take much wine.

804. A person who wishes to take much wine should avoid taking much food beforehand, and the components of the meal should include diuretics. If he should become replete with food or wine, he should procure emesis and take hydromel (=honey and water); then procure emesis again; then wash out the mouth with vinegar and honey, and apply cold water on the face.

805. If wine has an injurious effect on the body and is heating to the liver, the diet should include some dish containing for instance the juice of (sour) unripe grapes, and the like, and the articles of food which are generally served with the wine after the end of a meal (dessert) should include such as pomegranate, and tart things like citron.

If the wine is liable to go to the head, one should take less and take it dilute and clarified. After the meal, he should take such as quince with his wine.

If the harmful effect of wine consists in being heating to the stomach, the dessert should include toasted myrtle-seeds ; and one should suck a few camphor lozenges and other astringent and acrid things.

Harmful action of wine.	Remedy.
Heats the body and the liver ..	Bitter fruit, e.g., unripe grape-juice ; the dessert should be pomegranate ; citron.
Goes to the head	Take the wine dilute and clear ; as dessert, cydonia.
Heating to stomach	Toasted myrtle seeds ; suck a few camphor lozenges ; astringents ; acrid things.
Cooling to stomach	The dessert should include galangale, cloves, orange-peel.

806. As you know, old wine is like a medicine. It is only feebly nutritious. New wine clogs the liver and produces a hepatic " dysentery " by giving rise to much gas.

The best wine to take is that which is clear, white, tending to a red tinge, of good bouquet, and neither tart nor sweet in taste, neither old nor new.

A good drink which is widely known is made as follows: take three parts of marjoram, and one of water. Mix well. Boil to a fourth.

" and the host set before him, in vessels of gold and silver and crystal, raisin-wine *boiled down to one-third* with fruits and spices." (Night 415, Burton).

807. If a gnawing feeling come on after taking wine, take pomegranate, cold water and syrup of absinthe next morning. Enter the bath after partaking of a small meal.

Wine which is thoroughly diluted softens the stomach, makes it humid and allays thirst. Diluted wine intoxicates quickly because the watery constituent takes it quickly into the blood.

808. The wise person will avoid drinking wine when fasting or before the limbs have been refreshed in warm water, or after vigorous exercise ; for both these entail a strain on the brain and nerves, and render a person liable to develop cramp and amentia ; they produce either actual illness or at least undue heat.

809. *Intoxication.* Frequent intoxication breaks down the constitution of the liver and brain, weakens the nerves, and tends to produce diseases of the nervous system, apoplexy, and sudden death.

When wine is taken to excess it is changed, in the case of some persons, into a bad kind of bilious humour ; or, in the case of others, into pure vinegar. In both cases, the changes in the stomach are very injurious.

Some persons claim that it is an advantage to become intoxicated once or twice a month, for, they say, it allays the animal passions, inclines to repose, provokes the urine and sweat, and gets rid of effete matters.

The most detrimental of the effects of wine is that upon the brain. That is why those who are not strong in that way should take but the very least amount of wine, and diluted.

Treatment. If called to a person who has drunk wine to excess, emesis should be procured as speedily as possible. Failing that he may drink a considerable quantity of water, with or without honey. When emesis has been procured, he should bathe in a full length bath. Then he should be thoroughly rubbed with oil, and left to go to sleep.

810. To give wine to youths is like adding fire to a fire already prepared with matchwood. Young adults should take it in moderation. But elderly persons may take as much as they can tolerate.

Wine is borne better in a cold country than in a hot one.

811. If a person wishes deliberately to take his fill of wine, he must take no food, or anything sweet. The [Persian] " white broth " [made of meat, onions, butter, cheese, etc.] may be allowed ; also grated bread steeped in broth made with fat meat cut into pieces. He should have an inunction. He should avoid physical labour or exercise. Then after the meal, when he wishes to drink, he should accompany it with almonds, salted lentils, and a condiment prepared with salted capers.

It is an advantage to include in the menu cabbage boiled with meat ; olives boiled in water, and the like. For this conduces to drinking more wine. Anything which lightens the fumes of the wine is also helpful—for instance the seeds of Syrian beet ; cummin, dry rue, pennyroyal, Nabathean salt, cardamoms ; and more particularly, any aliments which are viscous and glutinous, for they aggregate the fumes (e.g. oily, sweet and viscous articles of food) and prevent inebriety in spite of drinking so much wine, by restraining the rapidity with which the wine enters the blood.

Inebriation is rapid (1) when there is weakness of the brain, (2) when there is an abundance of humours ; (3) when the wine is strong ; (4) when the food is scanty ; (5) when the regimen is itself depraved ; (6) when the wine is taken continuously (for a long time).

When the cause of the ready inebriation is weakness of the brain, the remedy is to use the epithemes named in the chapter on catarrh, and give sedatives, and avoid fluids.

812. The following syrup averts inebriety : one part of juice of white cabbage; one part of juice of unripe pomegranate, a half-part of vinegar. Simmer. Take one ounce before taking the wine. The following is another remedy : pills containing salt, rue, black cummin. Eat pill by pill. The following is another.—Take seeds of Syrian beet, cummin, peeled bitter almond, pennyroyal, absinthe, Nabathean salt, cardamom, dry rue.

A person who is not afraid of a " hot " mixture, may take two drams by weight in a draught with cold water, fasting.

813. *Agents which restore from inebriety.* Let the person take water and vinegar several times one after the other, or whey-water and junket. Let him sniff at camphor and sandalwood. Put cold repercussives over his head, such as rose oil and wine-vinegar.

The treatment of inebriety is discussed in the special part.

" He said : 'arouse him, O Sahim.' So he made him smell vinegar and frankincense ; and he cast the Bhang from his nostrils and opened his eyes." (Night 649). To this, Burton remarks : " acids have ever been and are still administered as counter-inebriants, while hot spices and sweets greatly increase the effect of Bhang, opium, henbane, datura, etc."

814. ANAESTHETICS. If it is desirable to get a person unconscious quickly, without his being harmed, add sweet-smelling moss to the wine, or lignum aloes.

If it is desirable to procure a deeply unconscious state, so as to enable the pain to be borne which is involved in painful applications to a member, place darnel-water into the wine ; or administer fumitory, opium, hyoscyamus (half-dram dose of each); nutmeg, crude aloes-wood (4 grains of each). Add this to the wine, and take as much as is necessary for the purpose.—Or, boil black hyoscyamus in water, with mandragore bark, until it becomes red. Add this to the wine.

Burton,[104] (ii. 478), commenting on the word tabannuj (hemp), which is an " anaesthetic " adds, " anaesthetics have been used in surgery throughout the East for centuries before ether and chloroform became the fashion in the civilized West." (Night 263.)

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§ 248. Strictly speaking, instructions on diet to the patient should rest upon practical acquaintance with the culinary art, as having a prior place over the questions of forbidding and allowing such and such articles of food, food values, and the like. The form in which a given article in the dietary is to be given is of real importance, and the combinations into which the foods enter require notice at least to the same extent as is done with the ingredients of a medicinal prescription. Mutual decompositions occur with foodstuffs either before or after ingestion. Interactions may render the " composite " indigestible, or non-palatable, or actually harmful ; the use of too little of one ingredient in a recipe or of too much should be prevented ; the temperature to which the mixture is exposed —the rate at which that temperature is reached, whether too quickly or too slowly—whether it is maintained steadily or whether through some mismanagement the " mixture " was allowed to cool noticeably in the midst of the operations—all such details call for consideration both as to a possible explanation of persistent gastro-intestinal trouble, and as to guiding the management of any ailment in any system or organ.

The displacement of materia medica from its ancient throne is partly to be ascribed to a cessation of attention to detailed knowledge about herbs* and the part which horticultural skill and care, as well as climatic conditions and geographical factors play in the production of efficacious remedies ; it is also ascribable to entirely insufficient attention to the preparation of the recipes—for these originally were exacting as to manner of compounding ; and both these types of indifference rest upon a scepticism as to the possibility of such details being of the least importance. In the absence of knowledge on these points, the decriers of the use of drugs, and of complex prescriptions speak unjustifiably.

So, again, in the matter of the preparation of the invalid's food, or the dietary for the chronic ailment, it is reasonable to plead for that care whose real importance is every day proved by those who, having the means, will desire their meals from some one chef in preference to some other.

§ 249. In the whole of the preceding chapter Avicenna is referring to a cuisine which is foreign to us. Perhaps of all European countries, Spain offers the nearest approach to his. Those who have been in the East, and have enquired into the practical details in their cookery recipes—not merely such as may be available in written form, but also such as are actually carried out in well-to-do establishments or by the humbler housewife, (for in this country also there is much difference between "Beeton" and actual practice) are more easily able to follow Avicenna's nomenclature.

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* It has proved impracticable to include in this volume a translation of the second Book of the Qanun, which deals with this subject, and provides a text capable of thorough expansion and adaptation to modern requirements.

§ 250. Very little research suffices to convince the enquirer of the very great scope of this subject. Interesting as it is, it would therefore lead too far to attempt proper discussion in these pages. It must suffice to insist that the names of foods and dishes which Avicenna gives bear a different meaning to those same names with which we are familiar. Confusion would only be prevented by giving the names in the original language. Many of the words are Persian; some of the dishes are Syrian; others are Indian.

§ 251. ARABIAN DISHES.—The following notes from Lane and Burton will serve to show the type of dishes which may be regarded as characteristically Arabian.

"Among the more common dishes are the following:—Lamb or mutton cut into small pieces, and stewed with various vegetables, and sometimes with peaches, apricots, or jujubes, and sugar; cucumbers or small gourds, or the fruit of the black or white egg-plant, stuffed with rice and minced meat, etc.; vine-leaves or pieces of lettuce-leaf or cabbage-leaf, enclosing a similar composition; small morsels of lamb or mutton roasted on skewers, called kabāb. (**796**). Fowls simply roasted or boiled, or boned, and stuffed with raisins, pistachio nuts, crumbled bread, and parsley; and various kinds of pastry and other sweets.

"The repast is frequently commenced with soup, and is generally ended with boiled rice, mixed with a little butter, and seasoned with salt and pepper; or, after this, is served a water-melon or other fruit, or a bowl of a sweet drink composed of water with raisins, and sometimes other kinds of fruit, boiled in it, and then sugar, and with a little rose-water added to it when cool. The meat, having generally little fat, is cooked with clarified butter, and is so thoroughly done that it is easily divided with the fingers. A whole lamb, stuffed in the same manner as the fowls above mentioned, is not a very uncommon dish. (Lane,[159] Nights, i. 171.)

"They brought him . . . dishes of poultry besides other birds and brewises, fritters and cooling marinades." (Night 415, Burton). . . . "a mess of cooked pomegranate seed." (Night, 712.)

"A very common kind of pastry is a pancake, which is made very thin (**662**), and folded over several times like a napkin; it is saturated with butter, and generally sweetened with honey or sugar; as is also another kind which somewhat resembles vermicelli." (Lane.)

'Adasīyah: soup of yellow lentils, made by boiling them in water till nearly dissolved, and then adding vinegar, coriander, and salt.

Faṭūrat: junket: a light food for early breakfast, of which the Faṭīrah-cake was a favourite item. (Burton, vi. 160.)

Fruits.—Almond, almond-apricot, apple, apricot, banana, bergamot pear, bitter orange, blood-orange, cherry, citron, date, fig, grape, hazelnut, jujube, lemon, lime, lote, mulberry, olive, peach, plum, pomegranate, quince, shaddock, sugar-cane, sweet-orange, sycamore-fig, walnut, water-melon. (Lane, i. 301; Burton, v. 281-287.)

Ḥiṣrimīyah.—A broth of kid's flesh, lamb, and fowl seasoned with ḥiṣrim, the juice expressed from the grape while unripe.

Jamar: palm-pith eaten with sugar (Burton, v. 284).

Ka'ak al-'I'd: "Cake"; bun. A special sweet cake eaten with dates and sherbets. (Burton, iv. 394.)

Kabāb (see **796**).

Kunāfah: vermicelli cake; a favourite dish of wheaten flour worked somewhat finer than our vermicelli, fried with samn (butter melted and clarified) and sweetened with honey or sugar. It may be sweetened with bees' honey (Night 989) in preference to the frequently used various syrups. (Burton, vi. 150.)

Sawiq. See Polenta (**796**).

Sikbāj.—Acid minced fleshmeat, dressed with vinegar and honey, or with acid syrup. Raisins, a few figs and chiches were sometimes added. (Lane, i. 435.)

Shurayk.—A cake or bun, the size of the palm of the hand, with two long cuts and sundry oblique crosscuts, made of leavened dough, glazed with egg and clarified butter, and flavoured with spices (cinnamon, curcuma, artesmisia, prunus mahalab, and sundry aromatic seeds—specified by Lane as aniseed, nigella, absinthium (Artemisia arborescens) and camphor, etc. (Nights, v. 509.)

Soured milk.—See **796**.

Yakhmi.—Stew. A complicated broth prepared from rice and meat. (Burton, iv. 387.)

Zardah.—A rice dish. Rice dressed with honey and saffron (ib. p. 385).

Zirbaj.—A sour meat dish similar to sikbaj (above).

§ 252. The following scheme serves to distinguish differences often overlooked in the popular dictionary definitions :—

	Word.	Definition.
1.	Aliment	Palatable food-material. Raw foods often in their natural state (Dict. syn: food, nourishment) = **15** + non-nutrient, **22** *b* and *c*.
2.	Article of food	The ingredients of a "dish." They are sometimes raw, sometimes prepared or manufactured. Any "foods" obtainable at the various shops.
3.	Beverage	Any agreeable liquor for drinking (Dict.)
4.	Diet	(*a*) **2**; (*b*) exact order and No. of **8**.
5.	Diet-drink	A medicated liquor (Dict.)
6.	Dietary	A course of diet; allowance of provisions (Dict.) A list of **2**.
7.	Dietetics	A science dealing with **4**, **2**, etc. Rules for regulating diet (Dict.)
8.	Dishes	The product of a recipe as served on the table, whether cooked or raw (e.g., salad dish, etc.), **2**, **4**.
9.	Drinkables	General terms for anything not immediately harmful. Not necessarily harmless after leaving the stomach. Not necessarily nutritious.
10.	Eatables	
11.	Food	A general term for anything which "being digested nourishes the body" (Dict). Syn. for literary style; food-material; aliment; nutrient; provisions—but only so applicable loosely.
12.	Food-stuffs	(*a*) **9**, **2** (*b*) **1**
13.	Food-material	Scholast.: a special ex. of "materia."
14.	Meal	A course or series of dishes—"taken at one time." (Dict.)
15.	Nutrient	The actual nutritive substances of which **9**, **10**, **11**, **21** are made. Potential nutriment.
16.	Nutriment	The nutritive subs. which enter the blood (i.e., sep. off by digestion in stomach).

17.	Nutritive substance	- The chem. subs. known to biochemistry—Proteins, CHO, fats, salts as general groups; aminoacids, glucose, etc., as specific subs.
18.	Potables - -	- Same as **3**.
19.	Ptisan - -	- A special form of beverage, medicinal.
20.	Provisions -	- Roughly, **2**, **3**; more exactly, **2** as found in certain shops.
21.	Victuals. - -	- Same as **17**; i.e., certain special forms of **2**.
22.	Waste matters -	- (*a*) Effete matters if after metabolism; (*b*) Non-nutrient substances of **1**, **2**, **10**, &c.; (*c*) entirely indigestible; ∴ never absorbed.

§ 253. Some of the preceding may be grouped as follows:—

2 = *n* (**12**) + *n′* (**12′**) or *n* (**13**).

12 chemically contains aminoacids, carbohydrates, hydrocarbons, salts, and metaphysically the four "elements."

2 are taken (*a*) raw (milk, eggs, salads, fruits);
(*b*) prepared in some way (i.) dairy products, confectionery, bakery; (ii.) groceries, spices, condiments; (iii.) flesh food; fish; fowl; (iv.) vegetables; pot-herbs; (v.) special dishes = **8**.

8 contribute to make **14**.

After the meal has been taken, the food material becomes (*a*) nutriment—nutritious to a varying degree; (*b*) effete substances, or wastes.

After circulating these are classified as (*a*) true nutrients; (*b*) excrementitious substances (products of metabolism which are no longer of use to any tissue).

9. On Sleep and the Waking State.

815. The causes of natural sleep and of lethargy, and their opposite states—the waking state, and insomnia;* their effects; the remedial measures applicable when they are baneful; the significance of each; and all other points about them—all these have been dealt with in brief in the appropriate place (**336-340**). The special treatment will be discussed later.

816. *Physiological effects of sleep.* At the present, we may say that sleep in moderation (1) assists the vegetative faculties in their functions, and (2) brings the sensitive faculties into repose and in so doing (3) renews and restores them, and thereby (4) arrests the dissipation of the breath (the vital power). Hence (1) the digestion of the food in the several stages we have named is accomplished. Sleep also (3) remedies the weakness due to the dispersal of the breath (vital power) in various ways; namely, by bodily fatigue, by coitus, by anger or violent emotional disturbance, and the rest.

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* Sleeplessness caused by joy.—" Nor did slumber visit him for the excess of his joy."—(Night 779; Burton.)

Furthermore, a moderated amount of sleep brings about an equilibrium in regard to quantity and quality of the humours, and therefore it has a humectant and warming action, which is specially advantageous for the aged, who need their moisture preserving and renewing. That is why Galen said " every night I partake of a little packet of herbs—lettuce combined with aromatics ; the former because they induce sleep, the latter because they rectify the coldness of the lettuce." And he said, " I am now careful to obtain sleep because I am an old man, and the humidity which sleep brings is beneficial to me."

817. This then is *the way to obtain sleep*. And if a bath be taken after the digestion of the meal has been completed, and plenty of hot water is poured over the head, this will be an additional help. A still more efficient method will be mentioned under medicaments.

818. *Conditions to observe regarding sleep*. Healthy persons should pay attention to the subject of sleep : it must be moderate, properly timed, and excess must be avoided. And on the other hand they must avoid the injury resulting to mental and all other faculties from remaining awake too long.

However a person is often driven to keep awake, and refrain from sleep owing to a dread of syncope and loss of strength.

The best sleep is that which is deep ; and that which occurs after the food has passed on from the upper part of the intestine, and after the flatulences and eructations which may have followed have subsided ; for to sleep on this is detrimental in many ways, though the person himself may not know of it ; it keeps him turning from side to side in his sleep ; it hinders digestion ; and it does injury. For this reason, if the passage of the food out of the stomach is delayed, he should take a walk for a little while, and then retire to sleep.

It is also bad to go to sleep on an empty stomach, as this is weakening. It is bad to go to sleep after repletion, before the food has left the stomach, because sleep cannot be deep under such circumstances, and the sleeper will keep turning from one side to the other all the time. For when the natural faculties are busy with the work of digestion at a time when it is accustomed to be asleep, the fact of being prevented from waking up is disturbing to the natural faculties ; so they become dulled and the process of digestion is disorganized.

It is also bad to go to sleep during the day, for in this case illnesses depending on humidity and catarrhal states are brought about; the colour of health passes off, the spleen becomes heavy, the nerves lose their tone; lack of vim and a poor appetite are noticed, and inflammatory conditions and fevers often appear.

Among the reasons for the injurious effects are: liability to sudden interruption of the sleep, whereby the natural faculties become dulled.

Among the good qualities of sleeping by night are that it should be continuous and deep. If a person is accustomed to sleep during the day, he should not suddenly discard this custom, but do so gradually.

Burton[104] explains the following: Aylulah, or "beauty-sleep": slumbering after morning prayers, causing heaviness and idleness. Ghaylulah: dozing about 9 a.m., which leads to poverty and wretchedness. Kaylulah, or "forty-winks," about noon; the mid-day siesta praised by the Prophet. Qaylulah: sleeping before evening prayers. Faylulah: slumbering after sunset. The last two were held to be highly detrimental (i. 461, footnote).

819. *Posture in sleep.* The best way to sleep is to begin on the right side, and then turn round to the left. If one begins by lying face downwards, it greatly helps the food to digest, for by this posture the innate heat is conserved and magnified.

It is a bad practice to sleep on the back. It courts the development of grave maladies like apoplexy, paralysis, and nightmare, because the effete matters then tend to accumulate in the tissues of the back, where they are held and prevented from entering the natural channels—which are in front, like the nostrils and palate. Persons who are accustomed to sleep on their backs often become debilitated, for their muscles and members become weakened; also because one side cannot alternate with the other, seeing that such persons quickly return to the supine position, the back being more powerful than the sides. The consequence is that such persons sleep with their mouth open, for the muscles which keep the jaws closed are too weak to maintain them in that position.

A special chapter is given on this subject in the Special Part.

10. ON CERTAIN MATTERS LEFT OVER TO A LATER PLACE.

820. We leave over till later the discussion of coitus and its constitution, and the measures to be taken to correct errors in this function, though strictly they belong to this place. It is reserved to the Special Part.

At this point also, one would discuss the agents for procuring evacuation of the bowel, and how to deal with any antagonistic influences towards them. We reserve this subject to the section dealing with treatment and the chapter on purgatives. However, we may say here that a person who wishes to maintain his health should procure evacuations by the bowel, the urine, the sweat, and the sputum.

We shall also explain how one may assist and regulate the menstrual flow of women, in order that you may become familiar with this.

11. How the Members may be Strengthened. How Weak Persons may be Made Stronger. How to Gain Flesh, and Increase the Size of the Body.

821. Members (limbs) which are weakly and undersized may be strengthened and caused to grow and develop during the period of growth, up to the final limit for growth, by the use of a suitable degree of massage and of a suitable form of exercise, steadily persisted in. Also by the use of pitch plaster (see **871**). An exercise consisting of holding the breath [according to proper rules] is also effective, especially for the respiratory organs (thorax, lungs).

For instance, let us suppose the legs to be underdeveloped; the person takes a short running exercise; then a certain amount of massage is given; then a plaster of pitch is applied. Next day the running exercise is prolonged a little, but the amount of massage remains the same as on the first day. On the third day, the massage given is to the same extent as before, but the exercise is still further lengthened, taking care to stop short of distension of the vessels, for this would show matters are lodging in them which might be antecedent to some inflammatory process or repletion specifically met with in them: varices, and elephantiasis being an instance of such. Therefore, should there be any suspicion of anything of that nature, shorten the exercise to the original degree, reduce the massage; enjoin rest in the recumbent position; raise the affected member. Thus, if the persons have a wasted (lit. dried up) leg, raise it by the foot, and apply massage from its distal towards its proximal end.

To carry this method out for parts related to the organs of respiration—the thorax, for example—we proceed to apply a bandage to the lower parts, making it moderately tight, and of uniform breadth. Then we instruct the patient to exercise his arms, and to breathe as deeply as possible, uttering a loud sound the while,* light massage being applied as well.

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* This may be assumed to be a singing exercise, a sustained note being produced for as long as possible at each breath.

This subject will be fully discussed in the Special Part on Beauty Culture, if Allah will.

12. ON THE LASSITUDE FOLLOWING EXERCISE.

822. There are three kinds of lassitude, and we may add a fourth. There are two modes. The three varieties are: the Ulcerose, the Tensive, and the Inflammative. The fourth variety which we add is the Desiccative or Arefactive.

823. *Ulcerose lassitude.* This is a form in which the subject experiences the sensation of ulcers upon the body or in the depths of the skin. The deeper the sensation the greater is the lassitude. The sensation may be evoked by contact with the skin; or it may be evoked by movement. Sometimes it gives rise to the sensation of pricking with needles, with a dread of movement, and the subject lies extended because of the weakness of his shoulders and arm-pits. If the degree of lassitude is still greater, there is a goose-skin. When it is still greater, tremors and fever appear.

The cause of this kind of lassitude consists in an abundance of tenuous and pungent effete matters, a liquefaction of the flesh and fat in consequence of the over-vigorous exercise, and, lastly, the presence of depraved humours in the vessels, which results in changes in the blood, whereby it loses its healthy character; these abnormal products pass into the skin and affect it. This form of lassitude is the lesser evil which such substances produce. If they should become mobile, goose-skin will result. If they move about still more actively, tremors result. Sometimes the pungent humours detach themselves from the others, leaving the "crude" humours in the vessels. Sometimes the "crude" humours are situated in the flesh.

824. *Tensive lassitude.* A person in a state of tensive lassitude has the sensation of the body being broken, of heat, of tension or being in a stretched condition, and has a dread of moving himself or straightening his back from the bent position. This is specially the case when the condition follows physical labour. [Cf. the pain of severe lumbago and myalgia.] This condition arises from the retention of waste matters in the muscles which are otherwise in themselves normal; it is not due to acridity or gaseous matters in them. The fibres are separated from one another, and there is a state of lightness or heaviness. This is often the result of want of sleep. When not associated with want of sleep, the case is different and more serious. Here the muscle fibres are stretched lengthways.

825. *Inflammative lassitude.* Here the body is hotter than usual. The part is as if distended, being swollen, and of corresponding colour. Distress is felt when the part is touched, or when he tries to move, for this brings out the tension or stretching [which is like the sensation in an inflamed or bruised tissue : Aeg.]. The deep-seated pain is called ostalgia. The cause is abundance of waste matters in the muscles.

826. *Desiccative lassitude.* This is a state wherein one feels a sensation of being dried up in an unusual degree. It follows (*a*) undue exercise, the chyme being normal ; (*b*) twisting the body back sharply ; (*c*) sometimes it is owing to dryness of atmosphere ; (*d*) deficient nutrition ; (*e*) fasting too much. [There is great disinclination for any movement : Aeg.]

827. *The two modes of lassitude.* (*a*) That following exercise. This is less serious. It is rectified by suitable measures. (*b*) Spontaneous. This is a forerunner of illness. Special measures must be used for its cure.

These two forms or modes may be combined, the matters which give rise to each being present together, both those which arise spontaneously, and those which result from exercise.

828. *Regimen.* The regimen for the simple form is known to you. That for the compound form entails the following rules : In the first place pay most attention to avoid the danger of the condition by dealing with the underlying cause. There may be three sources of danger: severity, the nobility (of the organ), and the substance involved. If two, or three are concurrent, the condition is more serious unless the one of them which outstays the other is more potent and therefore overrules them. For instance, inflammative lassitude is more severe, and the ulcerose form is nobler ; but if the substance underlying the ulcerose is far from equilibrium and from the natural course, it forms a restraining influence over the two modes of the inflammative lassitude, in virtue of this nobility and strength, and takes precedence over it. But if the relation be not so very remote, the inflammative lassitude would take the precedence.

13. STRETCHING AND YAWNING

829. Stretching comes on when effete substances have accumulated in the muscles. For this reason the desire to stretch oneself is often experienced after sleep.

If these humours become superabundant they give rise to goose-flesh and trembling and shivering. If they increase to a still greater degree, fever develops.

Yawning is really a form of stretching, when this takes place in the muscles of the jaws, lips and chest. Should it arise without any apparent reason in a person seemingly healthy, and not at an appropriate time, and to an unusual degree, it is bad. In such a case, it is best when it comes on at the end of digestion, because then it is due to the effete substances being expelled.

Stretching and yawning may be due to external cold, to thickening of texture of the skin (see **839**, ii), whereby exit of certain humours becomes restricted ; to being awakened from sleep before it has finished ; to postponing the evacuations.

Moderately diluted wine is good for this condition, provided there is no contra-indication.

14. ON THE TREATMENT OF LASSITUDE FOLLOWING EXERCISE

(The First Mode of Lassitude)

830. We may say that the chief object to be attained in treating lassitude is to prevent it from being followed by many diseases, including fevers.

Ulcerose lassitude is dealt with by reducing the amount of exercise if that be the cause. If at the same time there is an over-abundance of humours, they need to be expelled. If there be a transient sensation of nausea and satiety, these effects are counteracted by fasting, evacuation through the bowels, and dispersal of the humours in the subcutaneous tissues* by the use of plenty of light massage, carried out with oil devoid of astringency. Exercise is then resumed. On the first day the nourishment should consist of the usual quality of foods, in lessened amount. On the second day the diet should consist of humectants. If the vessels be patent, and there be " crude " serous humour in the mesentery, friction may help to " mature " it, especially if one could bring the virtue of calefacient medicines (digestives) to bear on it. Very good (calefacients) are : willow oil, ol. anethi ; oil of chamomile ; and the like. A decoction of beet-roots in oil, prepared in a double-vessel ; ointment of mallow-roots ; oil of the roots of cucumber asininus and of bryony ; oil of sweet-scented moss ; and any oil in which the latter (moss) has been incorporated. [Galen recommends discutients and restorative exercise.]

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* Of the total humours of the body a certain proportion reaches the subcutaneous tissues, and may become stagnant in that situation. They require dispersal, and the agents used for such purpose are called " discutients." Possibly some of these agents were what are now called diaphoretics. But it must be remembered that the theory supposes the existence of matters which are discharged either in fluid or in gaseous form, the exit being by different " pores " in each case.

831. *Tensive lassitude*. The object in view in treating this is to relax the indurated tissues by means of a little gentle massage with oil heated in the sun ; tepid baths in which the patient stays a considerable time ; or, better, to take the bath once or twice a day, followed each time by an inunction ; complete rest. If it becomes necessary to procure an abstersion of the vessels, or if the oil of the inunction has become dried up, repeat the inunction and administer moist foods in only small amount. It is more important that the amount should be small in this case than in that of ulcerose lassitude. Exercise is sufficient to disperse this kind of lassitude, and cleanse out [the substances which cause it].

If tensive lassitude have arisen simply by the presence of gross superfluities, these must be evacuated. If it has arisen from flatulencies, it is dispersed by the use of such as cummin, caraway, anise.

832. *Inflammatory lassitude*. There are three aims in treatment of this condition : to relax the tense parts, to cool the heated parts, and to remove the superfluities. These are achieved by the use of plenty of tepid oil, by vigorous light massage, by a prolonged stay in a bath of tepid water (on the warm side), and by sufficient repose [and by repeated inunction: Aeg.].

833. *Arefactive lassitude*. First day : the normal regimen for maintaining health is to be continued, save that the bath-water should be hotter, because very hot water has a contracting effect upon the skin. This action is not as detrimental as that of cold water, for in this case there is a risk of the cold penetrating into the body, already dry. The cause of the wasting (wrinkling, shrivelling of the skin) may also lie in the fact that the skin is usually relaxed (see **818**).

The second day of the restorative treatment consists in the use of gentle restorative exercise of a light character. The bath should be carried out in the same way as on the first day, and the patient should then plunge into cold water, to make the skin shrivel, and to reduce perspiration to a minimum. In this way the skin keeps moist. For water will come in contact with the body as soon as there is sufficient heat in it to counteract the dryness of the skin. And these two factors mutually assist one another in combating the injurious effect of the cold. The injurious effect is greater if the person comes quickly out of the water into which he has plunged.

834. Those affected with lassitude need wholesome food, which must contain little moisture, and should be taken at the end of the first morning hour. Friction may be given on a later occasion, towards evening. The supper must then be taken later still.

The removal of superfluities from the body must also be procured, using massage with sweet, or willow oil [cf. the modern ol. betulae, or oil of wintergreen]. The abdominal muscles are not touched unless lassitude is present in them. In that case, give light inunction and increase the amount of such food as is not too heating.

835. One should take care that exercise should stop short of producing any sign of lassitude. Then proceed to reversion exercise in order to draw matters towards the skin by the moderate amount of movement. Having reached the skin, massage during the time of resting between the exercises will finally disperse these substances.

836. A person's condition is the guide, as regards *bathing*. If the bath should induce tremor, the last degree of lassitude has been reached. How much more is this true if fever comes on after the bath ! In such a case the bathing must be stopped, and recourse must be had to evacuation [of various kinds] and the rectification of the temperament.

As long as the water is moderately hot, and the bathing produces none of these adverse symptoms, one knows that it is beneficial to bathe.

837. If there were non-matured humours in the vessels, the first measure to take would be to apply whatever was suitable for the lassitude, and the next would be to endeavour to make the crude humours mature and become attenuated, and then to expel them. If they were plentiful, order rest ; forbid exercise. For rest is the great digestive. Avoid bleeding because by this means both pure and crude matters are expelled.

It is injurious to procure purgation before maturation. There is no harm in inducing diuresis. But avoid drugs which are very heating, for otherwise the crude humour would be caused to diffuse throughout the body, and facilitate its action.

838. *Diet* : include pepper, capers, ginger, vinegar of capers, vinegar of garlic, vinegar of spurge, and dried dates, and the well-known confections (i.e. of quince, apples, prunes, etc.), according to measure.

The appearance of a sediment in the urine informs us that maturation has occurred. One may now order wine to complete the maturation and to procure diuresis. The wine must be delicate and clear, and must not excite vomiting.

15. On other States which may Follow upon Exercise

839. We may first speak about the states, and then pass on to the subject of the regimen applicable for lassitude of autogenous origin.

(i) *Rarefaction of the skin* (turgescence, tumescence, relaxation, flaccidity, the opposite of (ii). Very often this is the result of insufficient massage, and of bathing. The treatment consists in dry friction, tending slightly to rough friction, using an astringent oil for the purpose.

(ii) *Thickening of the skin* (induration, constriction, tightness, tenseness, shrivelling, sclerosis, corrugation ; see **829**). This may be the result of (*a*) cold, (*b*) an astringent bath, (*c*) over-abundance of effete matters, (*d*) thickening—and aggregation—of coarse particles of effete matters, (*e*) change in the effete matters [or immatured humours] in the direction of viscidity, in consequence of which they cannot pass through the pores of the skin, and so block them ; (*f*) exercise, for this draws the humours out from the deeper (or remote) tissues, if no other cause for this has previously been in operation ; (*g*) residence in a dusty place ; (*h*) the use of rough and vigorous friction.

When it is due to cold and astringency, the colour of the skin is pale [because it is stretched hard and tight], and the bodily warmth returns only slowly ; sweating is delayed. The skin becomes red again on resuming exercise.—Such cases should be treated thus : the stay in the cold room of the bath must be very short, and the water must not be very cold ; then go into very hot water ; turn the patient from side to side, then on to the belly, then on to the back. The slab on which he lies the while must be of medium heat. Do this until perspiration sets in. Then anoint with thin [sweet : Aeg.] oils of a hot and resolvent character [oil of dill, of black poplar : Aeg.].

Cases due to exercise are distinguished by the absence of the above-named sign. The skin is discoloured by sweat and sordities. Such cases are treated by getting rid of such superfluities as may be present, and then carrying out a bath and inunction regimen of resolvent character.

Cases due to exposure to fine dust, or due to the use of too much rough friction, are much more in need of the bath than of inunction with oils. Soft friction is to be employed both before and after the bath.

(iii) Rarefaction of the skin may be associated with *weakness* (asthenia). This may be the result of (*a*) excessive exercise, especially if subsequent massage were insufficient; (*b*) over-indulgence in coitus; (*c*) too frequently repeated baths. The treatment of such cases therefore consists in the use of restorative exercises, and of dry friction, for which an astringent oil is used in order to obtain a hardening effect. The diet should include humectants in small amount, which are moderately calefacient or moderately infrigidant or slightly inclined to be "hot."

The same sort of treatment is used for asthenia, wakefulness, sadness, "dryness" in the nerves (or the state which follows on anger). In such cases, if the patient finds the digestive process of the food is depraved, the reversion exercises are not good; indeed no exercises are to be recommended.

When the cause of the weakness is an over-indulgence in baths, in eating and drinking, and inactivity, the patient suffers from undue humidity in the tissues (especially the tongue), and the activity of the limbs is impaired. Should this depend on some antecedent cause, the special treatment for that will become necessary.

In the case of any other causes which we have named—wine, undue inactivity, undue moistening effect of the bath—the best thing to do is to anoint the body, use vigorous exercise, employ rough dry friction without oil, or a massage with the aid of a small amount of a calefacient oil.

When a person experiences undue dryness of the skin of the hands, this belongs to the category of arefactive lassitude. The treatment is the same as for that condition.

16. The Treatment of Lassitude of Spontaneous Origin (The Second Mode of Lassitude)

840. The ulcerose state is recognized when the humour upon which it depends is within or without the vessels. The humour is shown to be within the vessels by (1) the urine being fetid, (2) the nature of the previous diet: for some articles of diet give rise to an undue proportion of superfluous matters in the blood; some articles of diet give rise to too few superfluous matters; or these matters are expelled too speedily; or medicinal treatment may become necessary for them; (3) the character of the fluids taken: if wine, whether clear or thick.

From all such data one comes to the conclusion that the site is within the vessels; if they are not found, the condition is extravascular.

841. In cases where the lassitude from superfluities is of extrinsic origin, and the vessels are unobstructed, it is sufficient to carry out reversion (restorative) exercises, and follow the regimen, to an increased degree, which we have indicated for cases of ulcerose lassitude due to exercise. But if the case belongs to the other group, one should not order exercise, but inactivity, sleep, fasting. Then, towards each evening, the abdomen should be anointed with oil, followed by a bath in moderately hot water, if his condition is such that he will stand the bath.

842. The *diet* should be of the character already stated: one which makes good chyme, fluid or semi-fluid [lit. able to be sucked, e.g. through a tube or spout], not viscid, and not particularly nutritious.—Examples of such foods are : barley, frumenty, game (provided it is delicate), syrupus acetosus with honey, mead, light white wine. A wine which is matured and diuretic need not be forbidden, but to begin with one would prefer to administer a wine which is slightly sour or rather yellow. Afterwards one changes to a white and light wine.

843. If this regimen proves ineffective it will show that the excess of humour present needs evacuation. Should it be the sanguineous humour, do a venesection [or scarify the ankles: Aeg.]. Otherwise, procure purgation, making your choice between them according to the proportion of sanguineous humour which you judge to exist. But take care not to do either if the vitality is low.

844. To ascertain the *kind of humour* concerned, one considers the character of the urine and sweat ; and the tendency towards sleep or wakefulness. It is a bad sign if sleep is banished in spite of a good regimen.

845. If one has ascertained that there is a deficiency of good blood in the body, and that the immature acrid humours are in excess, one must not bleed the patient or purge [or let him bathe (Aeg.)], but procure complete rest. Order attenuant foods and fluids ; avoid any fluid nourishment which is calefacient, but choose such as has a sharp or biting or incisive quality : e.g. syrupus acetosus, with honey [acid wines, capers with vinegar and honey : Aeg.]. If it be necessary to increase the power of the attenuants, put a little pepper into the food, and into the barley-water [especially as there is generally hypogastric flatulence : Aeg.]. Cumin and pepper may be needed to counteract the immaturity of the humours (i.e. acrid matters which have not been properly digested)—administering them either before or after a meal, or at bedtime, according as seems best to you. The dose is a small tablespoonful. Pennyroyal is not so good, for it is over-heating.

846. Now if one is absolutely certain that the immature humours are *not in the vessels* but in the tissues (lit. roots of the members) one orders massage ; laxative oils, especially in the mornings ; heating drinks—whose heat passes to the skin ; a long rest ; then a moderately hot bath. Prescribe pennyroyal fearlessly, whilst being sure to give it before meals and exercise.

847. If it be necessary to aid the gastric digestion before a meal, do not give a strongly penetrative remedy like pennyroyal, but choose cumin and pepper in small dose. Quince may also be used. One could administer more of the latter, if one decides that the extraneous heat of the body would not be much greater in degree by giving it. Beneficial remedies : inunction with oil of chamomile, of aniseed, of sweet marjoram, etc.—whether given alone or combined in wax. Their action is increased by resin, alone or with twice its volume of its oil.

848. When one has ascertained that the immature humours are *in the vessels*, and at the same time outside them, one would become more anxious. Do not lessen your efforts in consequence. If there be as much within as without, first aim at procuring the maturation of the humour ; pepper may be used for this purpose. To that, if one wishes, one may add parsley, and an equal weight of anise. In this way a greater degree of diuresis will be procured. Or, if one so desire, one may admix with it a little pennyroyal, and at the same time lessen the amount of cumin and pepper. These are lessened step by step until at last there remains simply nothing but pure pennyroyal. As soon as the (foreign matter) in the vessels has become digested, and has passed on out of them, one has to deal with that which is exterior to them. Pennyroyal will be useful for this purpose, whereas it was impeditive at first. Where the two conditions occur concurrently one must take special care not to attract the impure matter forcibly towards the surface of the body, or to the interior organs either. Hence one should not risk producing emesis too soon, or purging before the humours are rendered tenuous, and have been " cut " and matured. Exercise is also not ordered.

> " The old woman ceased not to . . . ply him with ptisanes and diet-drinks and make him savoury broths till, after the twelvemonth ended, his life returned to him." (Night 325, Burton.)

849. When the lassitude has passed away, and the colour of the skin is more healthy, and the urine normal (" mature "), plenty of massage is given and exercise in small amount. One considers whether there is any chance of a relapse, for in that case one would pause in these measures. If it appears that a relapse will not occur, the customary life with regard to bathing, inunction, massage, exercise, is gradually resumed. Finally the strength of the ointments used is brought back to the customary.

If a relapse is threatening, with a sensation like that of ulcerose lassitude, the regimen must be taken up again. If the relapse threatens without that sensation of ulcerose lassitude, the treatment is by reversion-exercise.

If the signs are ambiguous, and the sensation of lassitude is not marked, order rest.

850. The cause of *tensive* lassitude is: repletion without depravity of the humour. If the temperament is unhealthy, order venesection and an attenuant regimen. In the type of person of which we speak, the treatment is by attenuants and a certain amount of incisives; after that one helps the cure by using appropriate agents.

851. *Inflammative lassitude.* Treat by venesection. The choice of vein depends on the part most affected with lassitude, or the part in which the condition began; if it be the head, use the cephalic vein; if the chest or back, use the basilic vein; if the other members are chiefly affected, or there is no distinction of priority, bleed from the median vein of the arm. It may be necessary to bleed on the second or even the third day. On the first day, one bleeds as soon as the lassitude appears, otherwise the condition may become established. The proper time to bleed on the second or third day is sunset.

852. *Diet.* On the first day barley water alone, or juice of frumenty as long as there is no fever. If there is fever, give barley water alone. On the second day give a cooling or attempered oil like almond oil. On the third day give a " salad " made with lettuce or cucumber (or, members of the gourd family), or garden mallow [or, " beet " : Aeg.] or sorrel [in cold broth : Aeg.], and give rock fish in white broth (i.e. a special dish or recipe) and forbid drinking [cold : Aeg.] water as much as possible during this day.

If by the third day, the patient feels nausea, or, if he has an appetite but the stomach cannot digest the food, let him have mead, or a light white wine, or an attempered white wine. After the evacuations, take care not to give a great deal of food all at once, for undigested food will be drawn into the blood. This is due to three factors: (i) when there is not much food, the stomach greedily holds it, and its retentive power is antagonistic to the attractive power of the liver. When food is plentiful, the stomach is not greedy of it, and then its expulsive power helps the attractive power of the liver. The same holds good with each receptacle in turn in regard to that which comes next into play ; (ii) when there is much in the stomach, it does not get digested as well ; (iii) the presence of plenty of food means that there will be much nutriment for the blood, and the vessels [greedily absorb the chyle before it is digested : (Aeg.) and they] themselves are incapable of digesting it.

17. CONCERNING THE REGIMEN IN THE CASES WHERE THE TEMPERAMENT OF THE BODY IN DEFECTIVE

853. The temperament (constitution) of the body may be defective either from some deleterious influence, or from the natural course of events beginning from birth. In the former case the temperament was appropriate for a certain length of time, until persistent faulty regimen has produced a change which itself remains persistent. In the latter case the defective constitution has been present from the outset (of conception).

In the first group of cases, the error is in quantity or in quality, and the nature of the case is revealed by a study of the form of the body [physiognomy in the wide sense ; see also Kühne[128]]. The remedy is to have recourse to the corresponding contrary.

The second group of cases shows a depravity of the state of the body, in that there is a change either in the original constitution, or in the course of advancing years of life.

We therefore begin the subject by going into the regimen of old age.

THESIS III

1. General Remarks on the Regimen of Old Age

854. In brief, the regimen appropriate for old people consists in giving those forms of aliment, drink, and baths which render the body warm and moist (i.e. moistening, calefacient food ; warm or hot soft water baths). There should be plenty of sleep, and the time spent on the couch should be liberal—more than is legitimate for adults. The flow of urine should be continually assisted by diluents ; the mucus should be helped out of the stomach by way of the bowels and urine. The nature is too soft, and this needs correcting.

Massage : massage with oil, moderated both in quantity and quality so as to fall short of occasioning lassitude, is beneficial.

Exercise : Walking or horse-riding is taken after the massage. The choice depends on which is too fatiguing. If both forms of exercise are fatiguing, repeat the massage once or twice (instead).

Sleep: the air of the room : some pleasantly redolent aromatic should be used to perfume the air which is breathed, using one which is moderately " hot."

After sleep, the body should be anointed with oil in order to stimulate the sensitive faculties. After this the horse-riding or walking exercise may be taken.

2. The Food for Old Persons

855. Food should be given in small amounts at a time. There may be two, or three, meals a day, divided up according to the digestive power, and according to the general condition—whether robust or weakly. In the latter case, at the second or third hour they may partake of well-baked bread, and honey. At the seventh hour after the bath, they may partake of some one or other of the foods we shall name later, which are laxative in action. At bed-time, some laudable nutriment may be allowed.

When they are robust, old persons may have a rather more liberal supper, as long as they avoid any gross aliment which is likely to give rise to atrabilious or serous humour, and avoid all hot, sharp, or desiccative foods, such as dishes made with vinegar, salt or hot aromatics, seasoning, pickles, etc. These may, however, be allowed as medicaments.

Should some article of food in the first group have been taken which should have been avoided—such as salted foods, egg-plant, dried salted animal-game-meat, fish with tough flesh, smoked fish—then this must be counteracted with water-melon, and cucumber.

Should one of the other group have been wrongly taken—dishes made with vinegar, salt and strong aromatics (like " fish-jelly," dishes with pickles, savouries) the remedy is to use the contraries, and select only attenuant articles if one knows that there are superfluities in the body.

When the bowels have been opened, give humectant foods, followed by slightly attenuant foods, as we shall explain. [Olive oil may be given before the meal.]

For persons who like and can digest milk, it is beneficial. One knows that it is well-borne if it does not cause fullness over the liver and epigastrium, or itching, or pain. Milk is good for old persons because it is nutritious and humectant. Goats' and asses' milk are best. Asses' milk is recommended because among its properties is this that it is not cheesy, and it passes quickly through the intestines, especially if salt and honey have been added to it. However, one must be sure that the pasturage is free of pungent herbs, or sharp or bitter herbage and marsh-mallows, or very salty herbs.

856. Potherbs and fruits specially suitable for old persons : beets, celery [which is good for persons with a gouty tendency or tendency to calculus : Aeg.] ; also a little leek, which may be dished up with tasty aromatics to help digestion ; also olive oil [and pickles, olives, damascenes seasoned with salt : Aeg.]. This is specially chosen to take before the meal, in order to obtain a laxative effect. It is also an advantage to partake of such at bedtime, for they dispose one to sleep.

Ginger, which is really a medicine, is a good condiment for old persons. And there are various other medicines which may be taken as heating confections made with liquid extracts, taking them in sufficient amount to be warming without causing indigestion or being desiccative. It is essential that the nutrients should be humectant, without any likelihood of exerting a drying effect, and that they should be calefacient and help digestion.

857. Among the foods which may be enjoyed are such as are laxative, and congenial to the elderly body—namely, game-birds boiled with water and salt and flavoured nicely with condiments, and served with oil ; polypody root, which has been placed in chicken-broth or beet-broth, or in cabbage broth.

Articles of food which have a laxative action, appropriate for elderly persons.—For summer : figs and prunes ; for winter : dried figs cooked in water and in honey. They must be taken before food, to have the laxative effect. [Ripe figs are preferable, unless they cause unpleasant symptoms in the right hypochondrium : Aeg.]

858. If the individual has the peculiarity of being one day loose, and the next bound, solvent food-stuffs may be omitted. If the bowels are loose one day, and bound for two days, it will be sufficient to take such articles of food as cabbage water, and a (Persian) ptisan of barley containing bastard saffron, or turpentine gum, to the amount of one, two or three hazel-nuts. All these have the property of relaxing the bowels, and cleanse the interior organs without harm. Another good medicine is one compounded of the kernel of bastard saffron and twice its amount of dried figs. The dose is the size of a nut ; take in a draught.

859. *Purgation in elderly persons.* Another good remedy is an oil enema, for it empties the bowel as well as lubricates the bowel-walls, especially if sweet oil is used for the purpose. The rectum may simply be lubricated with oil. Strong clysters must be avoided because they dry the intestine. A moist unctuous clyster is very beneficial in cases where the bowels have been constipated for several days.

There are also other remedies for procuring gentle motions, and we shall specify these in the formulary.

[Avoid aloetic pills. Strong purges make the constipation worse. Aeg.]

The evacuations in old and decrepit persons must be procured with as little depression as possible, for it is greatly to their advantage to have the bowels opened gently.

If phlegm is engendered in the stomach, remove it by appropriate remedies, and then at once resume the diluent diet. If serous and mucoid waste matters accumulate, remove them by diuresis, and give oil before the meals. (Aeg.)

3. Wine for Elderly Persons

860. The wine which is best for elderly persons is old, red, with warming effect, and diuretic. New and white sweet wine should be avoided, unless a bath is taken after a meal at which such wine is taken, and unless there is thirst. In that case it is allowable to take white wine which is light without much body in it, thus taking the place of plain water.

Elderly persons must shun sweet wines which are likely to prove oppilative [but wines prepared with honey may be allowed even in cases where gout is threatened : Aeg.].

4. The Removal of Obstructions in Old Persons

861. Obstructions are very liable to result from the use of white wine. These may be cleared by the use of pennyroyal, capsicum, and by sprinkling pepper on the wine. Onions and garlic may be taken for the same purpose, if the person is accustomed to take them.

Theriac is also good, especially if the obstruction is recent.

These remedies are to be followed by a bath, by oil, and such aliments as meat-broth with frumenty and barley. Mead is beneficial both when there are actual obstructions or they are merely threatened, and is useful for averting joint-troubles. If there is a sensation of a block in a given member, or if there is a premonition of such, one should combine some diuretic remedy with it, like celery seed.

In cases where the (ureter or) urethra is blocked by a calculus something stronger is advisable, like parsley.

For obstruction in the lung, use hyssop, maidenhair, cassia wood, and the like.

5. Massage for Elderly Persons

862. Massage must be moderate in amount and quality ; feeble or tender parts must not be touched. Between the times of massage, the parts may be rubbed with rough towels (binders), or with the bare hands [i.e. without oil], in order to ensure that the members concerned shall not become enfeebled.

6. Exercise in Old Age

863. The factors to consider in regard to exercise in old age are : (1) the different bodily states [of different people] ; (2) the sequelae likely to arise from their ailments ; (3) their previous habits in regard to exercise.

For if towards the end of life the body is still equable it will be right to allow attempered exercises. If one part of the body should not be in a first-rate condition, then that part should not be exercised until the others have been exercised. For instance, if an ailment begin in the patient's head (like vertigo, or epilepsy), or if there is catarrh [nose, throat, etc.], or there is a liability to suffer from the ascent of " vapours " to the head and brain—then the exercise should not entail bending the head down ; the exercise should be of walking, running, horse-riding, and other exercises involving the lower parts of the body. On the other hand, if the ailment were in the feet, the exercise should employ the upper limbs : for instance, rowing, throwing weights, lifting weights. If the ailment be in the trunk (spleen, liver, stomach, intestines) the extremities should be exercised, supposing there is no contra-indication. If the ailment is in the chest, the lower limbs should be exercised. If the ailment is in the kidneys and bladder, only the upper limbs may be exercised. In these cases the exercises are not to be graduated strictly, as if the members were to be strengthened. In this respect the exercising differs from that for other periods of life. In early old age the same principles apply as for ordinary old age. In other periods of life the weaker members are progressively strengthened by the adoption of exercises for the purpose.

The exercise of members is sometimes allowable in the infirm, sometimes not. Thus it is not permissible if the members are " hot " or " dry," or if there are matters (in the body) which might be drawn down into the limbs by the exercises, and fail to undergo resolution in them in consequence.

THESIS IV

THE REGIMEN APPROPRIATE FOR CASES WHERE THE TEMPERAMENT IS NOT NORMAL

1. ON THE RECTIFICATION OF HOT INTEMPERAMENT

864. We may say that in the case of a hot intemperament (i.e. bilious habit or disposition), either there is an equilibrium of the two passive qualities, or there is either dryness or moisture. When the two passive qualities are balanced, the degree of heat will come to a limit ; it will never be predominant, for that would lead to dryness. If dryness is associated with the heat, the intemperament may be maintained over a long period of time, whereas if the heat is associated with moistness, the intemperament will be of short duration because the moisture becomes predominant and obliterates the "heat." However the heat sometimes comes to predominate and obliterate the moisture, producing desiccation. Consequently, the condition of a person whose temperament shows a preponderance of moisture will become improved towards the attainment of adult life, and then become equable, whereas later in life the extraneous moisture begins to increase and the bodily heat to diminish.

Therefore we may summarize the principles upon which the management of persons with hot intemperament is to be conducted in these two intentions : (1) to restore equilibrium; (2) to conserve the existing state of health.

To secure the first, a patient needs training during the early years of life, the "passions" being subdued in a willing obedience to orderly discipline during all that time. Unless the discipline is orderly there will be a liability to illness. This intention is also gained the more easily if care be taken that the aliment is appropriate for their particular intemperament because in this way the health recovered is also conserved.

865. Individuals with a hot intemperament who are attempered in respect of the two passive qualities, are nearly normal in health at the commencement of life, so that this kind of intemperament makes the teeth erupt early and the hair grow quickly ; such children will be ready of speech, clear in utterance, and quick walkers. As they grow older, the hotness becomes dominant, dryness increases, and the temperament "biting" [sharp-tempered]. Bilious humour is formed to excess in many of such individuals [as they grow older].

Accordingly, the regimen during the early years is the same as that of attempered constitutions, and as the temperament changes the regimen must be correspondingly changed, seeking to provoke the urine, and help the choleric humour out of the body either by the bowel, or by emesis [and by the urine]. For if nature (i.e. the action of the bowels) alone does not suffice to get rid of the excess of humour, emesis by mild remedies may help to do so—using such as plenty of warm water, either alone or with wine. The action of the bowels is secured by the use of such things as conserve of violet, confection of tamarinds, manna, and Persian manna.

Exercise should be lightened.

Food : only allow such as yields good chyme.

866. *Baths* : if these are necessary, they may be taken daily or every third day. But in that case nothing heating should be allowed (in the food). If the bath be taken after a meal, and it does not cause distension or heaviness over the liver or epigastrium, there need be no anxiety. But if such symptoms should arise, an aperient should be given. For instance, infusion of absinthe ; a mixture containing aloes, anise, bitter almond, and oxymel. The bathing after food should also be stopped [and the diet should be light, with deobstruents and viscid articles of food (Galen)]. These aperients are to be given at the end of the first stage of digestion, and before the second stage is completed. But there should be a certain interval of time between the aperient and the next meal—namely the interval between the morning exercise and the time for the bath. Inunction with oils is required, and a light white wine should be given. Cold water has a useful (weakening ; strengthening : marginal reading) influence.

All these suggestions apply specially to those whose temperament has been hot and dry from birth.*

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* Galen adds : "If bile passes down plentifully, good ; but if it regurgitates into the stomach, vomiting will become inevitable, and tepid water should be taken. Exercises should be done before meals ; and they must be slow and gentle in character.

Gymnastics are not required by persons of very hot temperament ; walking exercise is enough. The baths may be taken after a meal in such cases.

If the temperament is hot and dry, the regimen should be diluent (succulent food—bathing—avoid much or strenuous exercise).

During the summer, the bath should be taken early, and repeated after (the main) meal. Cold drinks may be allowed.

867. Those who have a hot and moist temperament show a tendency to (abnormal) decompositions in the various matters, which also tend to descend into the limbs. Such persons should take exercise of a kind which will favour dispersal (of humours), but is mild enough not to prove over-heating. A degree of activity likely to cause " ebullition " in the humours must be avoided.

A person who is not accustomed to much exercise should eschew it. Exercise should be taken after the bowels have been evacuated. Baths should be taken before the meal. Care should be taken to get rid of all superfluities (quickly).

When spring approaches, moderation should be observed in bloodletting and purgation.

2. THE RECTIFICATION OF A COLD INTEMPERAMENT

868. There are three kinds of cold intemperament. (1) When there is a balance between the two passive (qualities), the intention is to produce more innate heat by means of (*a*) hot aliments which are moderately moist and dry; (*b*) calefacient inunctions; (*c*) large electuaries; (*d*) evacuation of the corresponding humours; (*e*) baths likely to induce sweating; (*f*) exercises contributory to sweating.

(2) At some periods such persons may be attempered in regard to humidity, and yet it sometimes happens that the coldness gives rise to humidities.

(3) In those individuals in which there is dryness as well as the cold intemperament, the regimen should be prescribed as for old age.

Aegineta adds : " the dry kind is the worst, because this is the form characteristic of old age. Warming agents and diluents are needed (namely, moderate exercise, moist heating food, heating wines, plenty of sleep). The bowels should be emptied daily. Venery should be avoided.

The moist kind is " bad," because there is a liability to rheumatic affections. Here avoid bathing, and take light exercise often, and make use of moderately calefacient inunctions.

If the temperament is dry, avoid : tiring exercise, exposure to the sun ; prolonged wakeful state ; cares ; venery.

If the temperament be humid, more exercise is necessary, and the digestion in the stomach needs assistance, and also the urinary secretion. Rheumatic and plethoric complaints are liable to occur. The bath should be taken before meals, and twice or three times in the day. Aperients and diuretics should be given before food. Masticatories, cathartics, and diuretic wines are allowable.

3. THE REGIMEN FOR PERSONS PRONE TO ILLNESS

869. When persons are prone to illness, it is because of (1) repletion ; (2) the presence of immatured humours. In the former, the quantity requires modification ; in the latter the quality of the humours needs modification.

(1) The quantity of humours is modified by modifying the amount of food taken ; by increasing the exercise ; by massage before the bath (if the person is accustomed to exercise and massage ; otherwise these must be mild) ; by dividing the meals so that the food is not all taken at one time, and to satiety. If the skin acts very readily, and the inducing of sweating is customary, this may be procured. If the fact of the meal being taken slowly does not result in the pouring out of bilious humour into the stomach, the meal may be taken after the bath. But if it should do so, the meal should be taken before the bath. In the former case, the proper time for the meal is after the fourth hour.

But if bilious humour pours into the stomach, the meal is taken before the bath, and further, if there are symptoms of congestion in the liver, those among the above-named aperients which are appropriate to the temperament are administered. Should there also be symptoms pointing to (congestion in) the head, walking about is of assistance. If the food undergoes putrefaction in the stomach, and then passes on, no matter ; but if it do not pass on, one must administer cumin, or figs mixed with bastard saffron seeds. An electuary of this is named [in the Formulary].

4. To Help Lean Persons to put on Flesh

870. The chief cause of emaciation, as we have said, is a dry intemperament, dry mesentery, and dry atmosphere. When the mesentery is dry, it will not absorb nutriment, and this renders the degree of dryness and wasting still greater.

Note that emaciation, leanness, or wasting is here understood as including the condition of a person convalescent after a long illness.

Other causes of lean habit of body : attenuant regimen, attenuant medicines ; mental anxiety in a person of dry temperament.

"I observed a youth wasted with sickness, as he were a worn-out, dried-up waterskin. And as I looked on him, lo ! he repeated these couplets. . . ." (Night 410). The sickness here referred to is a frequent event among the lovers in these tales, being the effect of abstaining "from meat and drink, and being estranged from the solace of sleep" (Night 114), an effect proportionate to the mental anxiety arising from the pain of parting. The descriptions are graphic enough, and are equally applicable to cases of wasting from organic disease.

A warm temperament also predisposes to leanness. Fat persons are of cold temperament, and are therefore benefited if made "warm."

871. *Baths.* Before taking the bath, the skin is rubbed with linen cloths to a degree between rough and gentle, until the skin becomes red. The rubbing may then be more vigorous.

After that, a pitch plaster is applied* [for three or four days : Aeg.]. The object of the massage before the application of the pitch plaster is to prevent the puffing of the tissues from subsiding again. Exercise is to be moderate. The bath follows at once. The skin is dried with towels. Then massage is given, using [emollient (H. A.)] oils. Lastly, a meal of suitable type is given [fat meat, pulse, almonds, bread : Haly Abbas].

It will be seen that in this regimen, the bath is taken on an empty stomach. It will be noted that the rules regarding bathing state that a person is made thinner if he takes his bath after a meal, before the food has digested.

If the age, season, and custom allow of it, cold [tepid : Aeg.] water may be douched over the person.

Sleep should be encouraged. (Haly Abbas).

Emotional Life.—Pale persons who are poorly nourished would become stouter if they were aroused to anger, and mental excitement. (Aeg.)

If only a part of the body is wasted, as for instance after fracture, the vital powers must be stimulated ; moderate friction will encourage the circulation in the part, and warm water is douched over it in small quantities, until the skin reddens and swells. Suitable exercises are also carried out. Pitching may be done. If the part feels cold, friction with linen cloths should be done, or some mild calefacient applied, like thapsia made up with honey or wax. (Oribasius).

The above regimen is almost identical with that which we have spoken of for increasing the bulk of an undersized member. The completion of the subject will be found in the fourth book, when discussing beauty culture.

5. How to Reduce Obesity

872. The regimen which will reduce obesity. (1) Procure a rapid descent of the food from the stomach and intestines, in order to prevent completion of absorption by the mesentery. [One may take saltish things of laxative nature : Rhazes.] (2) Take food which is bulky but feebly nutritious. (3) Take the bath before food, often. [Take not food immediately after the bath, and a short sleep ; follow up the bath with massage ; make a long stay in the bath : Haly Abbas.] (4) Hard exercise. (5) Resolvent oils. [Rub in oil containing root of wild cucumber, marshmallows, gentian, all-heal root, birthwort root, poley, and centaury ; volatile ointments ; oil of dill : Aeg.] (6) Electuaries : the lesser myrobalan electuary ; electuary of lacca ; "theriac." (7) Take vinegar, and salt, while fasting.

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* "Pitching" consists in rubbing into the skin a preparation made by melting dried pitch in a little oil, and warming it to a consistence suitable. The skin must be shaved first. The plaster is then removed before it has quite set. It is then warmed again and re-applied. This is repeated several times. (Aetius).

Bituminous and sulphur baths may be used with advantage. (Rhazes.)

The subject is further discussed under the heading of beauty culture.

Other details: (Aeg.) :—*Meals*: only one a day. *Drinks*: take a fragrant draught before a meal. *Wines*: use thin white wines. *Sleep*: must not be protracted. *Baths*: use natural diaphoretic waters; if these are not available, add flower of salt to a sea-water bath; or add a large quantity of nitre. Sandbaths. *Massage*: dry rubbing with thick towels; rub with rough salts, such as nitre. *Medicinal Agents*: attenuants, that is, medicines which attenuate the humours; wild rue seed and tops of macedonian parsley, various strong diuretics, with or without pepper, and with or without asarabacca and anise; also the other remedies named in brackets above. Winter favours the formation of flesh and blood.

THESIS V

THE CHANGES IN THE ATMOSPHERE

THE REGIMEN ACCORDING TO THE SEASONS, AND THE VARIATIONS OF THE ATMOSPHERE

873. SPRING. At the onset of Spring one has recourse to bleeding. Cathartics are taken according to requirements and custom. Emesis should be induced. [Spring fills the system with humours (Rhazes)]. *Diet* : avoid very heating and moistening meats and drinks ; use attenuant articles of food. *Exercise*: in moderation, but in greater amount than is proper in summertime.

Too much food should not be taken at a time ; the meal should be divided over a period. As to drinks, take diuretic syrups and robs. *Avoid* hot, bitter, salt, or sharp things.

874. SUMMER. [Summer dissolves the humours and weakens the vitality (Rhazes).] Eat sparingly of foods. Moderate the drinks. Moderate the exercise. Take sufficient rest. Use diuretics plentifully. If emesis is possible, it is advisable. One should keep in the shade, under cover. The food should be infrigidant. [Avoid wine and venery (Rhazes).]

875. AUTUMN ; the season when the weather is changeable and unsettled. [Autumn engenders bad humours, bilious and sanguineous (Rhazes).] A more liberal regimen is here needed, if health is to be preserved. *Avoid* : desiccant agents ; sexual intercourse ; drinking much cold water ; cold shower baths ; sleeping in a cold place (cold enough to excite gooseflesh) ; retiring to sleep on a full stomach. It is advisable to protect oneself from the midday heat and the early morning cold breezes. Fruits are to be avoided, or at least taken only in small quantity [they supply bad chyme, and engender flatulencies (even figs and grapes do this) unless taken before food]. In bathing, only tepid water may be used. [Exercise should be moderate.]

During the time of the autumnal equinoxes, evacuations should be procured in order to ensure that the excrementitious particles shall not be held back in the system all winter. Although for some persons it is better to see that the humours are kept "on the move," it is usually best they should keep in repose.

As the age advances, emesis must no longer be procured in autumn lest fever should be encouraged to develop.

Wine must be well-diluted, and restricted as much as possible.

You may be assured that if the autumn is a wet one, there will be little likelihood of the usual autumnal disorders coming on.

876. WINTER. There should be plenty of physical work. Eat liberally, if the prevailing wind is northerly. If southerly, increase the exercise but diminish the amount of food.

Diet. The bread should be made heavier in winter than in summer. The same applies to flesh-meat, roasted meat, and the like. Potherbs : take cabbage, beet, celery. *Avoid* orach, red barley, purslane, endive.

[Aegineta allows acrid potherbs, and states that heating substances like pepper, cummin, mustard, rocket, may be taken liberally. As regards wine, he says more wine may be taken this season, using the strong and heating kinds.]

When the body is healthy, illnesses are unlikely to come on during the winter. Should they do so, however, the appropriate treatment should be used, including purgation if that is necessary. Illness will only arise under strong provocation, the agents being usually of a "hot" quality. The reason is that the innate heat, which is the determining factor, is very strong during the winter, because the cold prevents its dissipation, and collects it among the interior organs. Furthermore all the vegetative faculties are more efficient at this season.

Hippocrates favoured purgation to blood-letting. He was against procuring emesis during winter, though approving of it during summer, on the ground that the humours of the body are now on the move whereas in winter they tend to stagnate. One may use this fact as a pattern.

877. When the atmosphere becomes pestilential in character, the body should be given a desiccant regimen, and the dwelling-house should be constructed so as to be able to be kept cool and dry. When contagious diseases are abroad, the air should be warm, and charged with agents which prevent decomposition of the air. Things which emit pleasing odours are good, especially if they are contrary in temperament to that of the atmosphere.* Besides this, during times of pestilence, one should not allow draughts, but ventilation should be secured slowly, by means of small fans and ventilators.

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* ". . . had perfumed the place with musk, and aloes-wood, and ambergris." (Night 733.)

Very often air is contaminated from the soil. In this case it is well to sit on couches (instead of on the ground) and to seek out dwellings on ground which is as elevated as possible, so that the winds traverse them.

Very often, too, the air itself is the seat of the beginning of the decomposition changes—either because it is contaminated by adjoining impure air, or by some " celestial " agent of a quality at present unknown to man. In that case it is best to retire to underground dwellings, or to houses enclosed in walls on all sides, or to caves.

Fumigations may be used to purify the air : sedge (or, galangale), frankincense, myrtle, rose, sandalwood.

During the time when pestilences are about, one may use vinegar in both food and drinks, for this preserves one from the danger.

Other details will be discussed in the special part of this work, in order to complete the subject.

THESIS VI

I. THE SYMPTOMS PREMONITORY OF DISEASES

878.

Symptom.	Remedy.	Danger.
Tremor of the heart continuing persistently	—	Sudden death.
Nightmare, and vertigo frequent.	Evacuate the gross humour	Epilepsy; apoplexy.
Jerking movements of the whole body.	Evacuate the serous humour.	Convulsions; apoplexy.
Ditto, persisting long enough to affect vision and bodily movements. Also plethora.	Ditto.	Ditto.
Loss of sensation in the limbs	Ditto.	Paralysis.
Much twitching of the face ..	Procure cranial depletion.	Trismus.
Face becomes very red; tears flow; vision fails; headache.	Blood-letting purgation, etc.	Insanity; delirium.
Inexplicable sense of gloom and dread.	Evacuate the oxidised humour.	Melancholy.
Face reddens, swells, and darkens and keeps so.	—	Lepra.
Body heavy and relaxed; veins prominent.	Bleeding.	Rupture of a vessel; apoplexy; sudden death.
Face, eyelids and limbs slightly tumid	Treat the liver.	Dropsy.
Great stench from the faeces ..	Treat the putrescence in the vessels.	Fever.
Offensive urine	Ditto.	Ditto.
Lassitude and loss of spirits ..	—	Fever.
Loss of appetite; undue appetite.	—	Illness (in general).

In short, when any of the functions are abnormal in some way—appetite, defecation, urine, sexual desire, sleep, action of skin, itching, keen mental faculties, violent temper, unusual tastes, nocturnal pollutions—whether the abnormality is an increase or a decrease of function, or of quality or of character, one may be forewarned that some disease is on the point of supervening. Unusual events have the same significance. For instance, bleeding of piles, menstrual flow, vomiting persisting, nose-bleeding, craving for something, whether bad, or apparently good because in a way natural. For this reason one should not abstain from desired foods or things unless they are entirely bad, and even then, the abstention should take place gradually.

Some special symptoms denote particular conditions. Thus, persistent severe headache, and dilation of the pupil warn of cataract. The following are also forerunners of the same disease : imagining that there are bodies like insects, etc., in front of the face when one is sitting still and motionless ; great impairment of vision.

The following are also noteworthy :

Description.	Morbid state corresponding.
Heaviness and stabbing in right side.. ..	Liver disease.
Heaviness and tightness in sacral region and lumbar region ; urine abnormal.	Kidney disease.
Colourless stool	Jaundice.
Persistently scalding urine	Vesicle or penile ulcers.
Burning pain in anus on defecation	Dysentery.
Anorexia, vomiting, distension, pain in legs ..	Colic.
Pruritus ani, not due to worms	Piles.
Eruption of many boils and pimples	Internal imposthumes. Rupture of an abscess.
Serpiginous eczema (ringworm)	Leprosy ; black vitiligo ; white.
White morphew	White vitiligo.

2. General Remarks on the Regimen suitable for Travellers*

879. A person who is about to make a long journey must accustom himself to do without many things which are available in his own home, and must be prepared for hardships and pains. He must therefore take precautions against many illnesses [including fevers: Rhazes] to which he is exposed, if Allah will. He must be specially careful about diet and to avoid lassitude (a consequence of fatigue).

Persons of humid and phlegmatic temperament are not liable to develop fever from exposure. (Rhazes.)

880. *Preliminary Measures.* (i) Bodily state. One should not set out upon a journey when in a state of sanguineous or other plethora. A purge should be taken first. [If the journey is likely to be arduous, a bleeding should be done also : Aeg. —The body is rubbed with oil (Haly Abbas).] If there is a sense of nausea, due to indigestion, one should fast, and then sleep till the nausea has passed off, before proceeding on one's journey.

(ii.) Hygiene of body : it should be anointed with oil (ib.)

(iii.) Dress : A binder should be worn. This is at least five cubits in length, and six or seven fingers'-breadth. This is applied round the loins, and the hollow of the ribs. The head must be covered. Take also a staff, as a help both in descending and ascending hills. (Haly Abbas).

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* The matter in this chapter has been slightly re-arranged.

(iv.) Care of the eyes (from snow and dust): Expose them to the vapours produced by pouring wine on a heated stone, or to those of chamomile, dill, or marjoram. (Rhazes.)

(v.) Care of the feet. Wrap them in cloths smeared with calefacient oils. (ib.)

(vi) Sleeping and Fasting. If it is necessary to travel on without sleeping, the habit of doing with little sleep should be acquired by preliminary practice. Similarly, if there is a likelihood of long fasts and of long abstinence from fluids, a habituation to this should be made first. One should also accustom oneself to the kinds of foods one is likely to be able to obtain during the journey—foods of high degree of nutritive value, and taken in concentrated form.

Instructions differ according to the season of the year in which the journey is being made.—In winter, a purge should be taken before starting. The binder should be longer than above stated. The body is not to be anointed at the stages in the journey.—In Summer, the body must be covered to protect it from the sun. The binder is to be as stated above. (Aeg.)

881. *Exertion.* The exertion which a journey entails should be met by making the first day's work very little more arduous than that customary; and so grade the exertion day after day.

882. *Diet.* The food must be concentrated and of good substance, and allotted into rations which are not too bulky, so that digestion will be well completed, without leading to the accumulation of effete matters in the blood. Should hunger be very pressing, let the traveller take a snack of a quality appropriate for his temperament, and unlikely to induce thirst. This rule applies whether the journey be by night or by day.

Rhazes suggests chewing pickled onions en route, to assuage hunger. Note that night-time is preferred for travelling across deserts, or in hot countries generally.

Potherbs and fruits are to be eschewed, as also any articles likely to engender "crude" humours, unless such articles are required for medicinal purposes.

883. The traveller should not resume riding immediately after a good meal, because the food would then undergo decomposition, and thirst would arise. Then, after quenching the thirst, rumblings and distension of the stomach would supervene, and there would be nausea with satiative indigestion. Therefore, instead of so doing, one should wait till the time for alighting at the hospice, unless there is some special reason for doing otherwise, as presently to be stated.

884. A person may have to fast so long that the appetite is lost. To aid one in submitting to this, the following are useful: cold foods prepared from roast livers and the like, pills prepared with viscid or glutinous substances, strong fluid fats, almonds, and almond oil. Certain fats like that of beef will stave off the feeling of hunger for a long time. There is a story of a man having swallowed a pound (12 ozs.) of oil of violets in which fat had been dissolved until the oil was of the consistence of a plaster; he is said to have been free of desire for food for ten days.

885. *Precautions against thirst.* One may adopt a similar plan (to the preceding) when one knows one will have to suffer long from thirst. It is therefore advisable to inform oneself of those medicinal drinks which will abolish thirst, and are named in the third Book, in the chapter on "Thirst." A specially good medicine of this kind is furnished by dissolving three drams of purslane seed in vinegar.

Avoid any foods which are likely to evoke thirst. Namely, such as fish, capers, salted foods, sweets.

Converse as little as possible. Make the rate of walking gentle.

If there is a shortage of water, it is a good plan to add vinegar to it, for this allays thirst.

Rhazes gives: "Water with polenta sprinkled on it, and a moderate quantity of salt." Or, hold cool liquid in the mouth; pour cold water on the hands and feet.

Fatigue; Lassitude. This must be treated according to the chapter on that subject.

At the end of a journey.—Take a comfortable apartment; do not go near the fire. Rest.—Do not go to sleep for an hour. After that, the bath may be taken. Massage is then given till the skin is all ruddy. Then the traveller may go to sleep on a soft couch. (Rhazes).

3. REGIMEN APPLICABLE WHEN EXPOSED TO GREAT HEAT, ESPECIALLY WHEN TRAVELLING; REGIMEN SUITABLE FOR THOSE GOING TO HOT CLIMATES

886. The things to guard against are: asthenia, loss of bodily vigour, muscular weakness; insatiable thirst; sunstroke.

Therefore the head [and body: Aeg.] must be protected from the sun. Those who are making journeys must protect the chest, using an application composed of such things as mucilage of fleawort; purslane juice.

Persons about to journey into very hot regions will need to take something like barley-meal cakes, and fruit syrups, before starting off, for to ride on horseback (or camels) entails an unperceived loss of strength and vitality, if the intestines are empty, with nothing to replace the void. Therefore it is advisable to partake of such things as we have named in small amount, and wait awhile to give them time to pass out of the stomach, and so ensure that there will not be any splashing about of its contents.

One should use oil of rose and violets on the journey, anointing the back with them from time to time.

The injurious effect of travelling in the heat may be alleviated by having a swim in cold water, but it is best not to plunge in suddenly. One should wait a while and enter the water gradually.

887. If there is a risk of simooms, the nostrils and mouth should be covered, and one should go about in that way. Before being exposed to such a danger, one may eat onions with buttermilk and without butter ; or, better still, onions infused for a night in the milk ; and one may eat onions by themselves as well, and take the buttermilk after them. Before steeping the onions into the buttermilk, deep incisions should be made into them.

Another remedy is to make use of some fragrant substance like rose oil, and the oil of gourd-seeds. The latter may be sucked (as a lozenge) because it mitigates the ill-effects one fears.

888. If the sun-stroke has already occurred, let cold water be thrown over the limbs, and lave the face with it. Pour cooling oil like rose oil over the head, and also willow-oil, and cold juices like that of houseleek. Then lave. Sexual intercourse must be avoided. The rations should consist of cold pot-herbs. Salted fish is also appropriate, the person resting the while. Diluted wine is advantageous. If there is no fever, milk is the best food of all. But if there is fever (not of a putrid type, but of a one-day type), sour buttermilk should be given. If there is thirst after sunstroke, rinse the mouth with cold water. Water should not be swallowed to repletion, because of the risk of sudden death [from shock] thereby. The rinsing of the mouth should be done with moderation. If, however, there is an excessive craving for fluids, allow the patient to sip a little at intervals. Such thirst being due to the previous exertions, let him rest, and then drink. But it would be better to take rose oil with the first portion of water, and take the ordinary water after that.

In brief, when exposed to heat stay in a cool place ; lave the feet and hands with cool water. If thirsty drink cold water by sips. The food should be such as is readily digestible.

4. THE REGIMEN FOR THOSE TRAVELLING IN OR TO COLD CLIMATES AND ICY COUNTRIES

889. I consider that it is a very fearsome thing to travel in the intense cold, even if one takes great care and protects oneself by every possible precaution. So how much the more is it fearsome if the person has made no preparations at all ?

How many travellers have taken every possible precaution and have yet died from the exposure to cold, and the cold winds, worse because there is no rain—dying in convulsions, or tetanus, or were frozen to death ; or died with apoplexy, or died in the manner of persons who have been poisoned with opium or mandragore ?

And even if the condition to which they are reduced is not fatal, they often experience the pangs of hunger, as what is called bulimia—the treatment for which is described already in the proper place, along with that for other disorders of the same class. The best thing to do is to plug the nostrils and other apertures, and protect the mouth so that the cold air does not enter at once (into the lungs). The exposed parts must be protected in the way we shall describe [in **894**].

890. When the traveller in bitterly cold places has reached his halting-place, he should not approach a very hot fire at once, but gradually by degrees, beginning with a slight warmth, and slowly going nearer to the fire, though it would be better not to do that at all. However, even though the need of warmth is very great indeed, the approach must be still made gradual.

The traveller may push on quickly if he so wish, if the exposure to cold is not affecting him adversely, or depriving him of energy.

891. *Frostbite.* A person who has become frostbitten must be attended to without delay ; he must be warmed and the vitality restored by calefacient oils, especially those which possess the properties of theriac, like oil of lilies.

When the traveller has reached an inn, and is an hungered, let him partake of something warm ; he will get wonderfully warm, with fever-like heat.

892. *Provisions to take.* Certain kinds of provisions would enable the traveller to endure the exposure to cold more easily. Thus, any prepared foods containing plenty of garlic, nuts, mustard : asafoetida. " Lactic " cheese made up with barley (meal a special recipe) may be added in order to impart a pleasing taste to the garlic and nuts. [Pickled onions may be chewed (Rhazes).] Butter is also a good thing to take, especially if wine be drunk afterwards. Wine should be taken instead of water. One should take rest until the wine has come to rest within the body, and gives the sense of warmth.* He may then mount and continue his journey. No one should go out into the (bitter) cold on an empty stomach ; he should have taken plenty of nutriment.

Asafoetida is among the things which have a warming effect, when one is frozen with cold ; especially if wine is given at the same time. The initial dose is one drachm (12 = 1 oz.) of asafoetida to 1 lb. weight of wine.

893. The body may be protected from injury by the external cold by the use of epithemes, made with oil (pitch or tar). [The loins, spine, and chest may be bound with a long swathe, to protect them (Aeg.).]

Garlic (as an epitheme, **894**) is among the things useful for those exposed to a cold atmosphere.

Care of the eyes and feet. (See **880**.)

5. ON PROTECTING THE LIMBS FROM THE INJURIOUS EFFECTS OF COLD. FROSTBITE

894. The limbs should first be rubbed until they grow warm. Then use a warm liniment compounded with pleasantly smelling oils like that of lilies, and oil of myrobalan (benzoin). Syrup of lily flowers combined with aromatics. If this is not to hand, take oil, especially oil into which pepper, or pyrethrum, or euphorbium, or asafoetida, or castoreum have been placed.

Epithemes may be applied to the limbs to protect them from the cold, using galbanum, garlic, aided by pix liquida, for instance.

The foot-wear must not be so tight as to compress the feet, for freedom of movement is the best means of protection from cold, whereas restriction of movement interferes with (the circulation) and makes the limb cold. It is also a good plan to cover the feet with parchment, and wear fur over that.

If the hands or feet are not aware of the surrounding cold, so that one does not take the proper precautions against it, it is a sign that the sensation is already being lost, and the frost is already exerting its harmful action upon it. In such a case there must be no hesitation in action. For you know that once the (freezing) cold penetrates into a member, not only is the innate heat extinguished, but the very substance on which that heat depends is destroyed (dissolved, taḥallul). The tissues are then at the mercy of putrefaction. So there is an urgent need for all those measures which have been discussed in the chapter on ulcers, especially the grave eroding ulcers. If the degree of action is still short of the stage of putrefaction, the best thing is to place the limbs in snow water, or into water in which figs have been boiled, or cabbage, or myrtle (i.e., odoriferous things), or into dill water, or chamomile water. All these are beneficial. A good local application is made with pennyroyal. Wormwood of Pontus, and betony, and turnip are also good medicaments for the purpose.

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* Rhazes advises *hot* wine as a drink before setting out.

One must avoid exposure to direct heat.

It is also necessary to walk about quickly, moving the feet and limbs, doing exercises with these, and also applying friction, and inunction. Warm water may be poured over the part from a height, along with the other aforesaid measures.

895. It is important to realize that to allow the limbs to be still and motionless in the cold air, without exercising them in any way, is the surest way to subject them completely to the intense cold. Some people, however, actually make use of cold water for the purpose of overcoming frostbite, taking away the ill-effects of the cold just as is done with frozen fruits. For the plunging into cold water has the effect of drawing out the ice, and of washing it away, and melting the tissues and restoring them to a normal temperature, whereas exposure to heat would simply lead to decomposition. However it be done is no particular concern of the doctor.

896. If the extremity begins to become dark in colour, an incision should be made into it, to let the blood out of it ; the limb is then placed into warm water to prevent the blood from congealing and so failing to run out of the tissues. The flow is allowed to continue till it stops of its own accord. After that an epitheme is applied, using Armenian bole and vinegar blended together, for this antagonizes the injury done. Pix liquida is also a good adjuvant to this both at the commencement and at the conclusion.

When the darkness goes on to blackness or greenness, showing that the mortification is increasing, no time must be lost in stopping the process, for otherwise the healthy parts adjoining will become implicated and undergo putrefactive changes which will surely spread on into the interior organs. The measures to adopt under these circumstances are described in the appropriate chapter.

6. How to Preserve the Complexion while Travelling

897. The face should be treated by applying epithemes to it, which are prepared with viscid substances, such as mucilage of fleabane, mucilage of purslane, gum tragacanth in water, gum arabic in water, white of egg, and such things as rusks of the finest wheaten flour dissolved in water, Chritan lozenges.

When the face is exposed to biting winds, or cold or the action of (intense) sun, the measures to be adopted are those given in the section on "Beauty Culture."

Scented face powders of the East are referred to by Burton[104], who specifies one composed of rice-flour or powdered bark of the mango, deodar (uvaria longifolia), sandal-wood, lign-aloes, or curcuma (zerumbat or zedoaria) with rose-flowers, camphor, civet and anise-seed (v. 257).

7. How to Counteract the Injurious Effects of the Various Waters, while on a Journey

898. The traveller is more exposed to illness from the diversity of the drinking water than he is from the diversity of foods. Hence it is necessary to be particular about correcting the bad qualities of the drinking water, and expend every effort in purifying it.

1. Procure the rapid passage of water through the body by inducing sweating.
2. Boil the water, for as we have already pointed out, boiling sometimes clarifies the water and separates off the impurities which are admixed with the intrinsic substance of the water.
3. The best measure is to *distil* the water. This may be done by making a wick out of twisted wool, one end of which is placed in the full vessel and the other into an empty vessel. Water will then escape from the one to the other drop by drop. This is a good way of clarifying water when it is necessary to do so frequently.

Note this original use of the word "distil"; the water passes from one vessel to the other steadily drop by drop. When heat came to be used, the water being placed in an alembic, or nowadays, in a "retort" or "still" (a metal retort), the water also comes over drop by drop. The coming of the water drop by drop gives the name to the process of distilling. Poetically, dew "distils" on the flowers (i.e., drops of water appear on them); mercy "distils." The retort is the representative of the "twisted" wool, the glass vessel having been bent to form the condenser of the water vapour.

It may be noted that the action of capillarity would ensure the purity of the distillate, for salts will only travel a certain distance. Bacteria also will not ascend to the brim of the vessel, except possibly in the case of typhoid bacilli.

When the water is bitter and altogether unwholesome, one should boil it, and add pure sand to it while it is boiling. It is then distilled over drop by drop by using the wool as mentioned above.

It amounts to the same thing if the water be shaken with clean sand, especially when this material has been burnt in the sun. When the sand has settled, the water will be harmless.

4. Drink wine with the water, for that removes such injurious matter as is of feeble penetrative power.

5. If water is scarce and not attempered, it should be taken with vinegar, especially in summer-time, because that prevents one from drinking too much.

899. *Salty water* : take vinegar with it, and syrupus acetosus into which has been placed pulse and various species of myrtle and medlar.

Aluminous and bitter water : take aperients afterwards. It is also beneficial to take wine after it.

Sour water : take sweet things and oily things, mixed with julep afterwards. Chick-pea water, taken previously to the water, will make it harmless before one could wish. The same is true if one eats chick-peas first.

Stagnant and marshy water : these are putrescent. Do not take warm foods before drinking it. Afterwards take astringents made with cold fruits and potherbs, such as quince, apple, and sorrel.

Thick and turbid waters. Garlic should be taken after such waters. Among the reagents which will clear these waters is alum of Yamen (of Arabia).

900. Other things which remove the harmful properties of various waters : onions, because these act on them like a theriac ; especially onions and vinegar ; garlic ; and, among cold things, lettuce.

901. Another good rule in regard to the diversity of waters which travellers are likely to encounter is this : to carry some of the water from his home, to mix with it the earths from the inn in which he has stayed last ; then carry some of the water to the inn to which he goes next, and mix that with the water he has brought ; and go on in this manner until he reaches his destination. Similarly he may take some of the clay (sand) from his own home, and use that to mix with each successive specimen of water, shaking them with it, until it has cleared them.

902. One should be sure to pass all the drinking water through a cloth, in order to make sure there are no leeches or other creatures in it, or any minute particles of evil nature suspended in it. [E.g. incidentally, minute ova !]

It is a good rule also to take a sour rob with one, to mix with the various waters one is likely to have to drink.

8. Rules for Persons Travelling by Sea

903. Those who travel by sea often suffer from scotomia and vertigo, and the motion brings on nausea and vomiting, especially during the first few days of the voyage, after which it subsides. It is not wise to allow nausea and vomiting to continue longer than is required for getting rid of superfluities.* It should then cease.

904. *Measures to prevent sea-sickness.* It is justifiable to endeavour to *prevent sea-sickness.* Thus, take fruit such as of quince, maciana, and pomegranate. Parsley seed made into a drink will prevent nausea as long as one lies quite still ; and if one cannot lie still, it soothes the sense of nausea. Absinthe has the same effect.

Among the things which prevent seasickness are : nourishing the mouth of the stomach with tonic acetous substances, and such things as prevent " vapours " from rising into the head. Namely : Lentils in vinegar (or dried and boiled with a little pennyroyal, or boiled till soft and then triturated and dried and kept in an earthen vessel : Aeg.) ; juice of sour grapes ; a little pennyroyal, thyme ; bread broken up in weak and fragrant wine, or in cold water. Thyme is sometimes added to that.

The nostrils should also be smeared over on the inside with white lead (cosmetic) ointment.

Persistent Sea-Sickness.—Avoid all food. Take *a little* vinegar and honey with water in which thyme has been infused, or pennyroyal water with some fine polenta ; or take some weak fragrant wine, with fine polenta. Take antibilious remedies. (Rhazes).

Simple Precautionary Measures.—(1) Counteract the disagreeable smell of the ship by sniffing at quinces, thyme or pennyroyal. (Aeg.) (2) Do not look at the sea. (ib.) (3) Beware of the drinking water (ib.) (4) Note the diet already mentioned. (5) Have remedies against vermin. Mercury, oil, long birthwort or wearing wool smeared with oil or mercury ensures against lice. (Haly Abbas).

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* The first vomitings which occur at sea are often beneficial, and therefore need not be interfered with.

END OF PART THREE

§ 254. When prescribing a "regimen," or programme to be followed by the patient, especially where the ailment is chronic, or liable to become chronic, the following headings require to be considered.

I. *General.*—The conditions regarding Light, Air, the Climate of the place, and the physical environment—place of residence or work; the dwelling itself. The season of the year.

II. *Special.*—(1) The age and sex of the patient; (2) The food, drink, and necessary evacuations; (3) Sleep; (4) Exercise; (5) Clothing; (6) Personal habits: bathing, smoking; marital life; (7) Occupation or livelihood; (8) Mental environment and social conditions.

As regards Light: the importance of free access of light is well-known but is often neglected, and may account for some of the effects met with in the given case. An excess of exposure is equally faulty with deficiency.

As regards Air—impurity of the air constantly breathed; manufacturing towns; confined rooms, stuffiness of the bedroom because too small, etc.

As regards Climate, ample suggestions are discussed in §181, 188, **305-322**.

The importance of considering the Season is freely discussed in **261-273**, **280-305**. The habits as regards food, exercise, sleep, clothing, etc., must be adjusted according to the season.

Place of Residence.—Here belongs a consideration of the nature of the soil, of the water supply, of the prevailing winds; the heating and lighting; the drainage (**322**).

The dwelling itself.—Here we consider materials of construction, proximity of other dwellings, the aspect of the several rooms, point of compass faced, the colour of the walls in the rooms, the stability of the window-frames; type of fire-places; cellarage, etc.

The age of the patient is considered in terms of the periods of life specified in **51**. At each period there are certain variations of function and capacity which account both for the phenomena of the illness, and affect the efficacy of different modes of treatment—physical and mental. The sex is necessarily considered.

Food and Drink.—Here it is desirable that the physician should picture the actual meals he is advocating. It is not enough to make out a dietary in the form of a list of things allowed and things forbidden. The foods must be combined. The dishes may often be specified. The number of meals a day; the place where they are eaten; the actual time of day chosen; the time occupied over the several meals; the quantity taken at a meal; the kind of cooking—all these things need watching and regulating. The whole subject of adulteration and contamination of foods must be studied; the deleterious effect on foods produced by long keeping in shops or in refrigerators, etc.; artificial ripening of fruits; artificial methods of preserving foods; addition of preservative chemicals, etc.

It must here be emphasised that the idea of controlling diets by estimation of calories, and scientific calculation—so much a fetish in many places—overlooks that important personal factor which means so much for the ailing and sickly. "Man is a living organism, not a mechanism, and can produce a definite amount of protein and carbohydrate from a given quantity of food. . . . In practice the value of a food depends on the physical properties of food-stuffs, but also on the assimilative power of the digestive organs and the personal condition of the individual organs. (Muther).[134] "The public are apt to forget that not the quantity of food, but the efficiency of the gastric organs to digest and *assimilate* is the real criterion to go by." (ib.) Or, as has been wisely said: "Nature laughs at our scientific food values."

The actual composition of the meal may be considered from several aspects: the list of all possible articles which can be bought; the chemical composition of each; the food-value composition; the taste or palatability; the digestibility; the assimilability; incompatibilities; the effect on the bowels and urine; the personal idiosyncrasies (including anaphylactic actions); the relation to temperature of the air, season, age, sex, occupation; the mode of preparation; the materials used for cooking (water, steam, butter, margarine, fat, olive oil, etc.) Incompatibilities, both among solid foods, and among beverages, and between solids and fluids taken together or successively.

The action of the bowels must be seen to, and secured, as often it can be, by the proper choice of foods and modes of cooking rather than the random exhibition of various purges and aperients, and by exercise.

Sleep.—Here we must go into:—the time of retiring to bed; the time of rising; the duration of sleep; the kind of sleeping apartment; the position in bed; the kind of bed; the bed-clothes; the night-clothes; the nearness to a meal; the quality of the meal last taken; the time of day. (Repose taken during the day, relaxation of the mind for the time, from cares, business worries, and domestic anxieties, etc.)

Exercise.—Special exercises may be prescribed:—breathing-exercises, stretching exercises; gymnastic exercises: regulate time of day, relation to food, amount of clothing at the time.—Here belongs also the question of massage (kneading, stroking, pinching, tapping, beating, vibration of certain parts of the body: lower limbs, upper limbs, breast, abdomen, back, scalp, throat, face, and so on). See **739**, sqq.

Clothing.—Adapted to the season; materials used next to the skin; loose or tight; weight of materials used.

Personal Habits.—Prompt attention to calls of nature; cleanliness of skin. Smoking. Swimming and sea-bathing. Marital relations may need consideration.

Occupation or livelihood.—This often proves a determining factor if mistakes in advice are to be avoided. The influence which the daily occupation has in the commonest of our habits must never be disregarded. The occupation entails obedience to various rules impossible in many cases; we must also consider whether the occupation is agreeable or painful, or entails the repression of one or other psychical wishes or carries with it restrictions of an ethical or religious or ambitious or social nature.

Mental environment.—This is provided partly by the occupation; it also includes the recreations; the domestic side of life; the social side of life; amusements; company; friendships; leisure, etc.

Part IV

GENERAL THERAPEUTICS

The Various Modes of Treatment Applicable to Disease in General

General discourse on the Treatment of Disease.

The Treatment of Disorders of the Temperament.

" Evacuant " and " derivative " treatment.—Purgation, Emesis, Cupping, Venesection, Leeches.

The use of Liniments and Sprays.

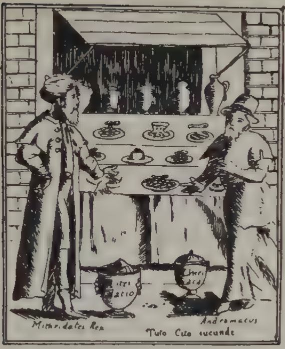
The treatment of " obstructions."

Minor Surgery.

The relief of Pain.

Selection of Methods.

1. General Discourse upon the Treatment of Disease.



905. The subject of *treatment* comprises three headlines: that of the regimen and diet, that of the use of medicines, and that of manual or operative interference.*

By the word "*regimen*" we understand the systematic management of the several factors which we have enumerated as being essential to health, and among them diet has an (important) place. The prescription of a regimen is based upon data pertaining to the qualities of the nutrients to be selected, as well as those belonging to the qualities which determine the choice of medicines.

906. Treatment with Food. In regard to *diet*, the first question to decide is as to the quantity of each article of food which should be allowed. Sometimes a given article of food is to be forbidden; sometimes lessened; sometimes no change need be made; sometimes the amount taken is to be increased. The physician only forbids a food, or all food, if he intends that the digestive faculties [throughout the body] shall be left entirely free to complete the maturation of the humours. He prescribes a lessened amount of a food, if he wishes the digestive powers to be conserved. The very fact of taking nutriment is a tax on the digestive faculties; therefore the withdrawal of a certain amount of food means a corresponding alleviation for them.

The physician must also be watchful in regard to two dangers—one, that the natural powers should become too enfeebled; the second, that an illness should become too grave.

907. *How to reduce the diet.*—This may be achieved in two directions—it is lessened either in amount, or in quality. In fact, by combining these two ways, one has a third method at one's disposal. To explain more exactly—an aliment may be bulky but poorly nutritious. For instance, pot-herbs, fruits. A person may eat plentifully of these without receiving much nourishment. On the other hand, an aliment may be small in bulk, but highly nutritious. For example, eggs; the testicles of fowls. It is, for instance, necessary to lessen the nutritive value of food, and increase its bulk, in cases where the appetite is altogether excessive and "crude" humours enter the blood. So we lull the appetite by filling up the stomach, and yet see to it that only a small amount of (nutritive) matter enters the blood, thereby enabling the digestive products already in the blood to become "matured" (properly disposed of). And there may be other reasons. On the other hand it may be desirable to increase the nutritive quality without adding to the bulk of the food; namely, when we wish to increase the bodily strength (vitality) and when the digestive power of the stomach is inadequate.

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* i.e. dietetics, pharmaceutics, surgery.

908. Diminution in the amount of food, or stopping food altogether is usually the line of treatment in acute illnesses. But sometimes we decrease the amount of food in chronic maladies also, though not to the same extent as in acute ones. The reason is that in the case of chronic maladies it is more necessary to see that the bodily strength is maintained, for we know that a long time will elapse before there can be a crisis or restoration to health. So unless the strength be maintained, the patient will not hold out until the time for crisis comes, and he cannot digest anything which takes a long time to digest. But in the case of acute illnesses, the crisis is near at hand, so we may confidently expect the vitality to hold out until that time. Did we have any doubt about this, we should see to it that the diet was not lowered too much.

It is not so necessary to diminish the amount of food in the earlier stages of an illness, when the symptoms are not very marked. In this way one conserves the natural powers. But as the illness progresses and the symptoms become more severe, so the amount of food is to be lessened according to the principles already stated. In this way the digestive powers are helped at the (critical) hour of struggle.

The regimen must also be made definitely attenuant during the height of the disease. The more acute the malady, and the nearer the crisis, the more attenuant must the regimen be made, unless there should happen to be contra-indications such as we shall name in the special part.

909. Aliment possesses two functions besides mere nutrition ; (*a*) rate of penetration, or absorption : rapid penetrative power, as for instance, wine ; slow penetrative power, as for instance, roast meats and fried meats ; (*b*) compactness of the substance of the digestive products in the blood, and consequent retention (e.g., this is the feature of the digestive products from pork and veal) ; or attenuation of substance, with consequent speedy dispersal (as is the feature of the digestive products of wine and figs).

We need to make use of an aliment of rapid penetrative power when we wish to remedy a loss of vital power, so as to revive it when there is not sufficient time or (digestive) power to justify waiting till the aliments are digested in their ordinary course, slow as that may be. We have also to take care not to take easily digested food after food which is only slowly digested, lest the result of the mixture be undesirable in the way already explained. We should also take care to avoid foods of solid texture, since we know for a fact that these give rise to obstructions (in the ducts and tissue channels as well as in the intestines).

Therefore we will select highly nutritious foods which digest slowly, when we wish to restore the strength of the patient, and make him fit to undertake strenuous exercise. We select a feebly nutritious food for a person whose pores are choked with dense matter.

910. TREATMENT WITH MEDICINES.

There are three rules to follow in selecting medicines : (1) selection according to quality—whether hot, cold, moist, dry; (2) selection of the amount to be given [*Dose*]. There are two sub-divisions here : (*a*) measurement in terms of weight, (*b*) measurement of its quality—degree of hot, cold, etc. quality, (3) the rules relative to the time of administration.

In regard to (1), the choice according to quality, the decision depends, strictly speaking, upon one's knowledge of the type of the malady to be treated. Once one knows the quality of the malady, the appropriate medicine is that whose quality is exactly opposite ; just as in the case of health, it is the like wherewith it is maintained.

In regard to (2), there are two factors to consider, in order to arrive at an arbitrary measure : (*a*) the nature of the member, (*b*) the degree of illness. Over and above these, are factors determining the suitability and fitness of the remedy, namely, species, age, custom, season, geographical position, occupation, strength, physique.

911. To understand the nature of the member one must know these four things about it: (i) its temperament; (ii) its construction; (iii) its position and relations; (iv) its strength.

(i) *Temperament.*—It is necessary to know the normal temperament of each member because this gives the clue to the degree of intemperament, by showing to what extent this has departed from the normal. One would thus form an idea as to the amount of change which is necessary to restore the part to health. For example, if the temperament in health were cold, and the present (intemperament) be hot, then the change from normal is considerable. A considerable amount of infrigidation will be necessary. But if both were hot, quite a trivial degree of infrigidation might suffice to restore health.

(ii) *Construction.* We have already stated that there are four modes of construction of a member, and the reader must study the matter in that place. But in addition it is necessary to be aware that (*a*) certain members have been constructed with openings of easy ingress, with ample spaces (receptacles) at the entry and exit (of the channels)* so that the waste products can be expelled readily by (appropriate) tenuous and attempered medicines. There are others which are not so formed, and in these cases stronger medicines become necessary. (*b*) Some members are loosely constructed, while others are dense in texture. For the former, tenuous medicine will suffice, whereas for the latter a powerful remedy is necessary. The strong medicine is the more necessary in cases where there is neither cavity nor receptacle—either interiorly or externally. Next in degree of strength of medicine is that which serves in the case where there is a receptacle in one of the two parts; and next to that is the strength of medicine applicable in the case where there is a receptacle on both sides. Examples of this: the kidney, which is dense, firm, brawny, and solid in texture; the lung, which is loose in texture [and obviously has pervading channels as well as an exterior orifice].

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* These channels comprise (*a*) the ordinary anatomical inlets and outlets of the body; (*b*) orifices of ducts which open into the alimentary tract, etc., and are not visible exteriorly; (*c*) channels of microscopic size which would not be included in an ordinary anatomical description; (*d*) tissue spaces which are not defined by limiting membranes, but are traversed by fluid constituents of the body. The terminal portion of a duct often shows an ampullary dilation, which comes under the category of a "receptacle" in the text. (*e*)Expansions of lumen of this kind also occur in the vascular channels; (*f*) perivascular and peritendinous sheaths.

(iii) *Site or position.* One knows about the site when one knows the position and the relations of the member. The advantage of knowing the anatomical relations of an organ is that one can then choose the part which will draw the given medicine, for thus one *compels* the medicine to travel in the desired direction. For instance : if there is pathological matter in the blood channels of the liver, one will evacuate it by way of the kidney ; if it be in the bile ducts, one will evacuate by way of the intestine. For the former is (physiologically) related to the kidney, and the latter to the intestine.

912. There is a threefold value in knowing the position of a part.

(1) Accessibility or remoteness.—If the organ to be reached is accessible, as is true in the case of the stomach, an attempered medicine brought to it will act on it (with certainty), whereas if the organ be distant, like the lung, the action of an attempered medicine will be nullified (because it has been changed by digestion) before it can reach the lung itself. Therefore, a stronger medicine becomes necessary in this case. When the organ affected is readily accessible to the medicine, so that the virtues of the latter at once come into play, the efficiency of the medicine will be directly proportionate to the severity of the malady. But if the medicine has to travel some distance before reaching the affected organ, and the malady more deeply seated than can be met by the penetrative power of the remedy, then the potency must be higher than usual. For instance, the amount of vinegar needed is greater when applied in a plaster for sciatica.

(2) One must know what substances to admix with medicines in order to bring them rapidly to the affected organ. For instance, one must admix diuretics with a medicine for the urinary tract ; and saffron with medicines intended for the heart.

(3) One must know by what route the medicine is to be brought to the affected part. Thus, if we have ascertained that there are ulcers in the lower bowel, we inject remedies by the rectum ; whereas if we know that the ulcers are in the small intestine, we give the remedies as fluids by the mouth.

913. Sometimes it is advantageous to consider both situation and relations to other organs at the same time. This applies in the case where the whole of the morbid matter has been discharged into the member, or when it is in process of being so discharged. For as soon as we know that it is in process of descent to the particular spot, we may draw it out of the body altogether by making use of the following four principles :—

(*a*) The rule of diversity of parts.—One may draw from the right side to the left ; from above to the parts below.

(*b*) The rule of physiological relationship.—Thus, when the menstrual flow is controlled by applying cupping to the physiologically related organ—the breasts.

(*c*) The rule of directness.—Thus, for maladies of the liver, venesection is done in the right basilic ; in the case of the spleen, the left basilic vein is used.

(*d*) The rule of distance.—The member into which the morbid matters are drawn must not be too near to the one diseased.

If by chance the whole of the morbid matter has already been withdrawn, both sides of the body may be used together. For we may, if we desire, draw the material into the member itself, or first draw it into an adjoining physiologically related one, and then from that. For instance, we open both saphenous veins when treating maladies of the uterus, and we open the one (median) vein under the tongue, when treating double quinsy.

When you wish to draw morbid matter to another member to that from which you are drawing it, first allay the pain there. And take care that in so transferring the matter you are not crossing a vital organ.

914. (iv)—The value of assessing the power or *strength of a member* lies in three directions: (1) it enables us to direct the treatment in the order of nobility of organs. Thus, one must not use potent drugs which might act on the principal [vital] organs to so great an extent as to risk producing a harmful effect all over the body. So, when it is necessary to withdraw matter from the brain or liver, one would not attempt to do so at the same period of the disease, and one must not apply infrigidants too assiduously. Again, when we wish to apply external applications over the liver and at the same time introduce resolvent medicines, we must take care to combine astringent drugs of aromatic character with them, so as not to risk interfering with the functional capacity of the organ. The same rule applies when giving fluid remedies. In applying these rules, the order of importance of the organ is : heart, brain, liver.

(2) The treatment is directed to an organ of physiologically related function, provided the organ selected is not a vital one, like the stomach and lung. For instance, one does not give very cold water in cases of fever, when the stomach

is weak. You are aware, too, that to administer undiluted remedies, which are relaxing to vital organs or to organs closely related to them, is simply to imperil life.

(3) One takes the sensibility of an organ into consideration—whether it is keen or dull. That is, one must beware of giving drugs possessing injurious (mordant, pungent or toxic) qualities, to very sensitive organs, or organs of special sense—for instance, plants belonging to the euphorbia group.

915. There are three kinds of medicines in the administration of which we must be very cautious. Those which are extremely resolvent ; those which are cooling ; and those which are contrary in property. Examples : lead and copper salts, and the like.

This, then, is how one chooses medicines according to the nature or character of the organ to be treated.

916. Choice of medicine according to *the severity of the illness*.—For example, when the degree of morbid heat of the body is unduly great, it must be counteracted by means of a medicine of strongly infrigidant character. But when the abnormality consists in a marked degree of coldness, this is met by exhibiting a strongly calefacient medicine. If the degree of abnormality is not marked, remedies of weaker quality will suffice.

917. Choice of medicine according to *stage of the disease*.—When we know the stage at which a disease is, we adjust the treatment accordingly. Thus, if an inflammatory focus is in the initial stage, we shall apply a remedy which will act upon it alone. If the disease is near the terminal stage, we may apply a remedy which will resolve it (at that phase). If the disease is between these two stages, we should combine both forms of remedy. If the disease be acute, we should at first aim at attenuation by means of an attempered regimen ; but at the later stage we should seek to procure attenuation. In the case of a chronic disease, we should not aim at attenuant treatment in the early stages, and we should use a modified attenuation at the later stage, though it is true that an attenuant regimen disperses many chronic maladies besides fevers. Again, if a malady is due to active fermentation of the humours, we procure evacuation [incl. venesection] at the early stages, without waiting for the "matter" to undergo maturation. But if the fermentation is only moderate in degree, we wait till maturation is complete before undertaking the evacuant measures.

918. You can easily recognize which *factors* are *favourable to the end in view* (and how to adapt them accordingly). Thus, air is the most important of all such, and one needs to take care that it shall assist the action of the medicinal treatment and not contribute to an aggravation of the illness.

919. In the case of maladies where any delay in treatment might entail a loss of vitality, or where one wishes to do more than merely alleviate, we shall begin with a strong medicinal agent. But if there is no fear of such an eventuality, we may proceed in orderly fashion, using a milder remedy first and the stronger one if that proves insufficient.

Further, you must not forsake the direct rule of treatment if you find that there is only a tardy response to it ; and, on the other hand, you must not commit the fault of delay when there is no contra-indication. In addition, you must not confine yourself to one single medicinal remedy throughout the treatment, but you must interchange the medicines (all the time), because when (the tissues) are accustomed to one they cease to respond, and moreover, the same tissue or member, or the body as a whole, may react to one given medicine at one time or phase and not at another.

920. When you do not know the nature of a malady, leave it to Nature ; do not strive to hasten matters. For either Nature will bring about the cure or it will itself reveal clearly what the malady really is.

921. *Treatment of pain.* When the malady is accompanied by pain, whether the pain is the cause or the effect, as in the case of blows or falls, the first thing to do is to allay the pain. If it is necessary to induce a stuporose state, do not go beyond the use of such as white poppy. Its anodyne action is well-known.

When the member is hyper-sensitive, nourish it with such things as render the blood viscid, as for instance, cooked grain. If this is not sufficient, and there is no reason to be afraid of infrigidation, such things as lettuce may be used.

922. Remember, too, that among the advantageous *contributory factors in treatment* is the help afforded by anything which exalts the sensitive and vital faculties : for instance, joyfulness. In consequence, one sets out to please one's patient, and ever tranquillise him by anything which can reasonably gratify him. Sometimes one may advantageously arouse his sense of shame, making him blush, and so leading the sick person to avoid what is harmful for him. (Cf. Anecdotes in Chahar Maqala[7] p. 82, 84).

A measure which is akin to the preceding is that of removing from one country to another, from one *climate* to another. Or a change is made from one external form to another. To do this, one particularises the various forms and movements which will act upon the given member, or alter its temperament. Thus one may advise a youth with disorders of vision to avoid very close writing and looking at very bright objects ; a person with squint [wry-neck : alternative reading] should look into a narrow mirror so held that the effort of turning towards it will help remedy the malposition of face, forehead or eye.

Another rule to be observed is to omit strong measures of treatment at the strong *seasons*, as far as possible. For instance, one refrains from violent purging, from provoking emesis, or from opening a part, or applying cautery, during summer or winter.

923. Gentle treatment is to be applied when two maladies are conjoined into one, such that contrary measures have to be carried out at the same time. For instance, if the malady is infrigidant, and its cause is warming—or conversely—the malady is to be treated with calefacients and the cause is to be treated with infrigidants. E.g., fever requires infrigidation, and the obstructions (in the channels) which give rise to the fever need the application of heat. Again, the indications in colic are warmth, incisives, and attenuants ; but the pain to which it gives rise needs cold, and analgesics.

924. Remember, further, that not every case of plethora is to be treated by its contrary, namely, evacuation (by purging or by venesection, e.g.) nor is every intemperament to be treated by inducing a contrary temperamental state. As a matter of fact, a liberal and good regimen will often suffice by itself to remedy plethora or intemperament.

2.—The Treatment of Disorders of Temperament.

925. When an intemperament occurs without (abnormal unhealthy) matter, the treatment is to alter it ; but if there is abnormal matter, this has to be evacuated. Usually a single evacuation will suffice to amend the previously existing intemperal state ; but sometimes it is not sufficient for the purpose, and the intemperament will then require rectification, after evacuation has been procured.

We may therefore state that the treatment of intemperament comprises several modes of procedure.

926. An intemperament is either chronic (longstanding), in which case the treatment is strictly by contrary, and a complete cure is achievable thereby ; or it appears at the terminal phase of an illness—in which case the treatment is by anticipation. Thus, treatment by contraries is instanced by the giving of theriaca for the putrefactive processes associated with quartan fever, and of (ice) cold water to abolish the fever of tertian fever. Treatment by anticipation is instanced by the use of evacuation, namely, by hellebore in the case of quartan, and by scammony in the case of tertian. The hellebore applies to atrabilious humour ; the scammony to bilious humour. Our object is thereby to prevent or forestall the (morbid) changes.

927. If in any given illness you are in doubt as to whether heat or cold is responsible, and you therefore desire to put the matter to the test, you must be careful not to overdo this, and not to be misled by secondary super-imposed symptoms. You must note that the appropriate moment is the same for infrigidation as for calefaction. But one is more apprehensive regarding infrigidation, for heat is the friend of "nature." One is as apprehensive of moistening as of dessication, but the period during which the former is permissible is longer. Moreover, the state of moistening and desiccation is in each case maintained simply by fostering the factors which give rise to them, and they are modified simply by re-inforcing the contraries of those factors.

928. Heat is re-inforced by the agents already expounded (**415**). Putrefication of the passages is carried out next, by procuring the expulsion of wastes, the removal of plethora, and by opening up obstructions. Finally the heat is to be conserved by preserving a moderate degree of moisture.

Cold is reinforced by assisting any factors which bring it about, by repressing the (bodily) heat, and by dispersing the heat unduly—to which dryness contributes by its essence, and heat secondarily.

929. In treating undue heat by removing obstructions, one must guard against producing too much infrigidation, for in that case there is a risk of rendering the obstruction still greater by conversion (of the matter) into a stone. One must also take care not to render a hot intemperament more marked. Hence the treatment by abstergents should be entered upon gradually. It is advantageous to use an abstergent which is sufficiently cooling (e.g., barley water, and endive). But if this be not adequate, one makes use of an agent which is neither " hot " nor " cold " ; and if this is inadequate, one employs an agent which is warm and tenuous. One need not be anxious in making use of such a remedy, for it lends further assistance by provoking diaphoresis, which renders the body cooler, thereby causing more good than the heating effect can harm; and anyway, it is easy to remove the heating effect once the pores have been opened.

930. It may happen that the innate heat is so much reduced (by such measures) that the digestion of the morbid humours is interfered with. Yet there are some who boldly pursue this wrongful method and ignore the fact that undue reduction of the innate heat means loss of vitality, which is specially to be expected in persons much weakened by illness. This result occurs even though the matter is rectified in some other way, and other maladies follow on, either in the form of simple intemperaments, or by arising out of " cold " matters which are opposite in quality to the temperament. When a cold intemperament is established, it is as difficult to render it warm as it is easy to do when it is only beginning. To render a cold intemperament warm at the outset is easier than to render a hot one cold at the outset. But to render a hot one cold at the end of the process, though difficult, is nevertheless easier than to render a cold one hot at the end of the process. The reason is that excess of cold itself implies complete, or nearly complete, destruction of the innate heat (cf. **894**).

931. Infrigidation is sometimes associated with desiccation, sometimes with moistness, and sometimes occurs independently of either. But dryness is more persistent, if associated with infrigidation, and moisture is more conducive to the supervention of coldness. All the factors producing calefaction aid desiccation if they are preponderant. All the factors producing infrigidation aid humectation if they are preponderant. Nothing is so likely to have this effect as inactivity, and constant use of the bath, even the full-length bath. [i.e., domestic as opposed to the Hammam.]—We have already made this known to you.—Diluted wine is also strongly humectant.

You must note also that if it is an old man who needs infrigidation and moistening, it is not enough to reduce the temperament to equability, one must continue till the temperament is cold and moist beyond the normal, because such a temperament is acquired secondarily, though quasi-natural to the old person.

932. Note, too, that when changing the quality of a temperament, it is often necessary to reinforce it by admixing with the remedy something of contrary quality. Thus we give vinegar with medicines which are hot towards a given member, because then their virtues can penetrate into the member; we give saffron with cardiac infrigidants, because saffron carries such remedies to the heart.

933. Oftentimes it happens that a medicine which produces a very marked change of temperament does not have a lasting effect; this is because it is so tenuous that its action does not pass on to completion. In this case we must admix with it something which will render it less tenuous and more stable, even though one risks the production of a contrary effect. Thus, we mix wax with balsam, and so on. The one remedy is thereby preserved long enough to ensure its proper action being accomplished.

3.—How to Determine the Manner and Moment for "Evacuation."

934. There are *ten indications* which show when it is right to procure "evacuation" [i.e., blood-letting, wet-cupping, purgation, enemas, diaphoresis, use of leeches, etc.]:

(1) Plethora; (2) vitality; (3) temperament; (4) appropriate symptoms (thus, we need not evacuate the bowel in a case of diarrhœa); (5) habit of body or physique; (6) the age of the patient; (7) the time of the year; (8) the state of the atmosphere; (9) the geographical situation; (10) the patient's mode of life regarding "evacuation"; and (11) his occupation.

Evacuation should not be carried out when there are contra-indications in these respects.

1.—*Plethora.* If the state is the opposite of plethora (vacuousness), evacuation is obviously contra-indicated.

2.—*Strength of Patient.* (Vitality). Weakness in any of the three primary faculties is a contra-indication. Nevertheless, we may decide to act in spite of such a weakness, if more harm is likely to accrue from neglecting evacuation. This applies to the sensory and motor faculties since we are more anxious to avoid injuring them if they are weak. In fact, the same applies with all the faculties.

3.—*Temperament.* Contra-indications are: hot and dry temperament; cold and moist temperament, in which there is little or no heat. One may act vigorously, however, if the temperament is hot and moist.

4.—*Symptoms.* Certain unfavourable symptoms are contra-indications—such as endemic diarrhœa and cramp (spasmodic diseases).

5.—*Physique or habit of body.*—Excessive leanness or spareness of build is a contra-indication, because the breath is so readily dispersed. For the same reason, when a person is weak and lean, and has much bilious humour in the blood, he must be treated blandly, and evacuation avoided. The aliment should be such as will engender good blood, (making it) incline to coolness and moistness of quality. In this manner the temperament of the humour will be corrected, after which the patient will perhaps be strong enough to tolerate evacuant measures.

Similarly, one must not venture to "evacuate" a patient who is accustomed to eat sparingly ; or, at least, one should postpone such a measure as long as possible.

Obesity is a contra-indication, because one runs the risk of making the frigidity dominant, and of allowing the flesh to compress the vessels up to occlusion, thus blocking the flow of innate heat ; or, of forcing out the effete matters from the vessels and driving them inwardly.

6.—*The Age of the Patient.* Avoid evacuant measures when the fulness of growth has not yet been reached, or when the patient is nearing the end of decrepitude.

7.—Avoid evacuant measures if *the time of the year* is extremely hot or extremely cold.

9.—*Geographical position.* A southerly country which is very hot is contra-indicative, for persons with diarrhœa are usually of hot temperament ("hot-tempered.") The association of two adverse conditions [the extraneous heat and the evacuation] is badly borne, because the bodily faculties are enfeebled by dispersal of vitality, and because the extraneous heat draws the "matter" outwardly, and the medicine draws it inwardly. Being thus drawn in two opposite directions, it tends to remain where it is.

Avoid evacuant measures in very cold, northerly countries.

10.—*Habits ;* Avoid evacuation when the habit is to have evacuations infrequently.

11.—*Occupation.* Avoid evacuant treatment when the occupation is one which in itself is evacuant in effect, e.g., bath-attendants ; carrying (heavy) loads on the back ; all toilsome or arduous physical labour.

935. In procuring evacuation there are five points to consider.—(1) Removal of that which is to be evacuated, followed by rest to the parts, unless there is atony (lassitude) in the receptacular spaces (see **911**, footnote), or overheating of the blood—whether in the form of ephemeral fever or of other accompanying maladies.—Thus there may be excoriation of the mucosa, which brings about diarrhœa ; or ulcers in the bladder. Such things may be advantageous, and yet not appreciated as such by the patient because of the pain and suffering they cause him until the symptom has been removed. (2) To choose which organ is to be "evacuated" : thus nausea is removed by emesis ; burning pain in the abdomen is eased by purgation. (3) To use as member of egress that which corresponds to the organ to be evacuated. Thus for maladies of the liver the right basilic and not the right cephalic must be used. To make an error in such a matter might be harmful. The member chosen for the site of evacuation must be less important ("noble") than that which is to be evacuated, lest the morbid matter pass down into the more important organ. The channel of exit should also be the natural one ; thus for the blood-vessels of the liver the urinary tract ; for the ducts of the liver the intestinal tract.

Sometimes the organ to be evacuated is itself the one to take as the site for evacuation, and yet it is the seat of chronic or acute disease. In this case it would be risky to induce the humours to traverse it, and they should be diverted to another organ instead.

Sometimes there is a risk of superimposing another malady on the first, by inducing a superabundance of the humours in the second part. For instance, if the morbid matter is drawn downwards from the eye to the throat, choking [œdema of glottis] might result, and therefore one must proceed with such a measure carefully and with gentleness.

Nature herself [i.e., the vegetative soul], often acts on the same principle, and protects a weak member by effecting the evacuation through a part other than that which would be the normal one for that member. Very often the part at which the evacuation actually occurs is quite distant, and opposite in position, and it comes to be a matter of doubt as to which member is being drained in this way. Thus the head may be drained by the anus, or the leg or the foot, and one could not say whether the evacuation is of the brain as a whole or only from one ventricle.

(4) To decide on the proper moment to evacuate. In

chronic maladies, as Galen rightly says, one does not wait for maturation. You know what is meant by the term "maturation." Therefore one should give attenuant drinks such as water of hyssop, of thyme, and herb seeds, before commencing to carry out the evacuant treatment, and after the maturation stage has been reached. But in *acute* maladies, it is best to wait till the maturation stage has been reached, especially as long as the humours are stagnant. Once they appear to be on the move, one must hasten to drain them away, because the damage accruing from their movement is greater than that which one risks by evacuating immatured humours—especially if the humours are tenuous, and especially if within vessels and not in the tissues in which they arise. When the morbid humour is confined to one particular member, it will certainly not move out of it until maturation has occurred in it, and its character has become modified—as has already been explained for you in the proper place.

Again, if we feel doubtful as to whether the vitality (of the patient) will hold out until the time for maturation has arrived, we shall proceed to procure evacuation, noting carefully whether the material to be evacuated is labile or viscid. In the latter case we must first render the material tenuous. And we shall know that it is viscid by the fact of the premonitory dyspeptic nausea having passed by, or by the existence of tensive pain under the hypochrondrium, or by the development of an inflammatory swelling inwardly. We must also carefully make sure that the passages are patent. Having taken these precautions you will be able to drain the morbid matter by the bowel before it has become purulent.

(5) *The amount to be evacuated.* This is judged from (*a*) the quantity of material already evacuated, (*b*) the strength of the patient, (*c*) the symptoms which remain afterwards. If symptoms should still remain, we must either reduce the amount of evacuation according to the amount already estimated, or we consider whether the symptom is itself to be treated, as would apply for instance in the case of plethoric spasmodic disorders.

(The marginal reading adds that the quality of the material must be considered, for it will not become mobile until it has been rendered tenuous.)

936. There are two ways of evacuating morbid material and eradicating it from the place where it has lodged : (i) by attraction from a distant place, (ii) by attraction to a neighbouring place. And the most appropriate time for carrying out the treatment is when there is no sort of plethora of the humours in the body, and they are not moving downwards into the member to which there is attraction.

Let us suppose, for instance, that there is a considerable flow of blood from above the mouth in a man, or from piles in a woman. To remedy this we may proceed to do one of two things. Either we draw downwards towards a neighbouring part of diverse character : that is, we cause the blood to flow down into the nostrils and emerge from them, in the one case ; and provoke the menstrual flow from the uterus in the other. Or we draw to a distant part of diverse character : that is, in the former example we bleed from veins in the lower part of the body, in the case of the male, and bleed from veins in the upper parts of the body, in the case of the female.

937. When the attraction has to be made from a distant part, one need not undertake to do so from both sides of the body, but just from that which is corresponding. Thus if the material is at the upper end on the right side, one would not draw it away to the lowest part on the left side, but to the lowest part of the right side (and indeed this would be the most necessary), or to the upper part of the left side, supposing there were as much distance between the two as there is between the humerus and the other, and not a matter of just the two sides of the head itself. For one would draw morbid material from the right side of the head down to the lower parts of the body, and not to the opposite side of the head.

938. Suppose one wishes to draw morbid material to a distant part—then one first allays the pain in the part, for this will itself lessen the amount of material by attraction, since pain exerts an attracting effect. But if it do not move to the part as soon as desired, avoid violent measures ; for while it is true that violence would procure the desired movement, yet the material would become attenuated and not amenable to the attracting influence, and would simply pass right into the painful part.

939. It may prove sufficient to draw the material away without actually evacuating, because the very attraction arrests its progress to the desired member. But even so, our object in securing attraction may still have been attained, supposing that one would be satisfied to have accomplished the attraction downwards without the additional evacuation. This is done when one bandages up the opposite member, or applies cupping-glasses, or rubefacient medicines—in short, any measure which allays pain.

940. Morbid materials are more readily evacuated when they are in the vessels than when in the tissues and joints, for sometimes it is difficult to remove them thence, and evacuate them. And in evacuating them from such situations one inevitably evacuates other things with them.

941. A person from whom diseased matter has been evacuated must not partake of much food or unhealthy articles of food and anything which has an indigestible nature. If by chance one is for some reason obliged to do so, one should do so gingerly and cautiously, in small portions, so that that which enters the body may be digested and prove harmless accordingly.

942. The drawing of blood is a special method of evacuating morbid humours which are all increased equally or proportionately. It is not the removal of one humour which is simply increased in amount or has its own particular quality destroyed.

943. To carry out evacuant treatment to an undue degree is to bring about febrile conditions.

If the bowels, previously usually loose, are bound, this condition will give rise to some other malady, and it will be proper to treat it by repeating the evacuation. For instance, supposing the discharge of sanious matter from the ears or mucous passages of the nose should cease, leading to vertigo, then if the flow be restored the vertigo will be removed.

It is less injurious to leave a little of the morbid matter behind than to strive to evacuate everything to the most minute fragment, thereby risking a dispersal of the vitality. Nature herself often removes the last remnants.

When the humour is of a kind which necessarily exists, you need not be afraid of how much blood you take as long as the sick person is able to sustain it. For sometimes one is bound to evacuate (bleed) up to syncope.

944. When the person is robust, and the humoral matter plentiful and depraved, evacuation must be done gradually. Further, if the morbid material is extremely viscid or widely diffused, or admixed with much blood, it cannot be emptied at one sitting. This is true in the case of sciatica, longstanding arthritis, cancer, old-standing skin diseases and obstinate furuncles.

945. Remember also that purgation draws morbid matters from the upper parts of the body, and discharges them below. Purging is, therefore, an attractive force in two different directions—to the near and to the remote region of the body. It is most useful when the morbid material is stagnant. Therefore, when the morbid matter is either above or below, one may draw it to the opposite direction, away from the position in which it has lodged. Attraction is procured by emesis ; eradication by the converse.

946. Furthermore, one varies the kind of blood-letting according to the positions from which the blood is taken up—as has been explained.

A person accustomed to a good diet, and having a healthy digestion, is less in need of evacuant measures than are most men.

Persons residing in hot countries need little in the way of evacuant treatment.

4.—THE GENERAL RULES TO BE OBSERVED IN PROCURING EMESIS OR PURGATION, AND THEIR MODE OF ACTION (UPON MORBID STATES).

947. Whenever purgation or emesis is to be procured, the food sufficient for one day should be divided up into portions to be partaken of in instalments. The aliments and drinks are diversified accordingly. For under the circumstances the stomach acquires the desire to expel what is in it, either upwards or downwards. The stomach is greedy for foods that are not diversified, and if no other food be taken in addition it holds its contents very stubbornly, especially if the amount be only small. This must be borne in mind by those who are naturally "loose."

948. Emesis and purgation and the like do not apply for those who follow a good regimen. This is because a person who controls himself properly will not need anything but mild attention, and may be excused even from exercises, bathing, and massage. If such a person be in a plethoric state, the humours concerned will be healthy, i.e., sanguineous. Consequently, such a person requires not purgation but blood-letting, if indications for cleansing the [channels of the body] should arise.

949. If both blood-letting and purgation (by hellebore and similar violent medicines) are needed, begin with the blood-letting, because this precept of Hippocrates in his book on Epidemics is sound. If, on the other hand, the plethora is of phlegmatic humours admixed with sanguineous humour, so that they are viscid and "cold," one would begin with purgation, because blood-letting would make the humours still more coarse, and more viscid.

950. In short, if the humours are in balanced proportion, blood-letting is preferable. Then, if a plethoric condition still persists, purgation is undertaken. If the humours are not in balanced proportion, first purge the superabundant humour until balance is restored, and then proceed with the blood-letting. If the patient should have taken medicine before the blood-letting (which was an error on his part), he should defer the subsequent blood-letting for a few days. If purgation is needed within a short time after the blood-letting, the appropriate medicine may be given then. Sometimes, however, the person who has (improperly) taken the draught of medicine, instead of first undergoing a blood-letting will develop fever and restlessness before it can be done. If the restlessness is not allayed by the usual remedies (sedatives), the blood-letting should be done.

951. Evacuant treatment is not necessary in every case of excessive plethora. It may be indicated by the severity of the malady, or by the quality of the plethora, rather than its degree. (Indeed, a good regimen will often make such measures unnecessary : marginal reading).

952. It may happen that there is a need for evacuation, but something intervenes which forms an adequate substitute, such as fasting, sleeping, correcting the unhealthy state of the temperament which has been produced by the plethora.

953. Then there is a form of evacuation which itself serves to protect one for instance from an attack of gout, or from an epileptic seizure which one knows will occur on a certain date, especially in spring. In this case one must apply the evacuant measure before the time is due, choosing the appropriate method—that is, choosing between blood-letting and purgation, according to the kind of things to be evacuated in the given malady. It may be also wise to apply desiccants externally, and to use absorbents for the purgation as one does in the case of those afflicted with dropsy.

954. Sometimes the medicine to be chosen as purgative must have a quality corresponding to that of the humour to be evacuated. Thus, scammony is needed for evacuating bilious humour. A drug which is of a different quality should be mixed with it as an adjuvant for the purgation without preventing proper evacuation. For instance, myrobalan. Should the temperament afterwards become unhealthy, one must just correct it.

955. Emesis should be procured in cases where there is an internal inflammatory mass, because such cases are difficult to purge. But if purgation becomes essential, use such agents as pellitory, seed of safflower, apozema of polypody, cassia fistula, and the like.

956. Hippocrates also says that the best way of cleansing a person of spare habit, and of a nature such that vomiting easily takes place, is to procure emesis; and this should be done in summer, spring, or autumn, but not in winter. But if he is of medium habit, it is better to purge. If evacuation by emesis is necessary, it is better to wait till summer, avoiding it altogether if it is not really necessary.

957. Prior to procuring purgation or emesis, the humour to be evacuated must be attenuated, and the channels of exit must be widened, and their outlet opened, in order to save the body from trouble. The last-named is achieved by an aperient (aperitive) regimen. That is, the patient accustoms himself to obey the calls of nature, and to maintain the motions loose. The actual medicines for purgation and emesis are reserved till later. Moreover, it is difficult, wearisome, and dangerous, to procure purgation when the belly is wasted.

§ 255. ARTICLES OF FOOD WHICH INCREASE THE ALVINE DISCHARGE (AEG.) AND PURIFY THE BLOOD.

Mildly aperient foods:—

Soft eggs.
Potherbs; beet, mallows, cabbage, sorrel.
Shellfish soup.

More strongly aperient foods:—

Milk whey, with salt; herb mercury boiled in water with salt.
Honey.
Elder-tree leaves; polypody root (oakfern), two drams sprinkled on pickle or taken in a ptisan.
Broth of old cock taken with or without 2 drams of bastard saffron.
Aloes to the amount of 3 chickpeas taken at supper-time.
Dodder of thyme in wine, taken after a moderate supper.

Still Stronger:—

Dodder of thyme (one dram) in wine, infused in vinegar and honey, taken before breakfast in spring time.

958. An emetic may be at the same time a purge (*a*) when the stomach is strong or (*b*) when taken during a state of prolonged fasting; (*c*) when gastro-enteritis is present; (*d*) if the bowels tend to be loose; (*e*) when the patient is not accustomed to emesis; (*f*) if the medicine is itself actually heavy (weighty) and passes down the intestines quickly as a result.

959. A purge will act as emetic (*a*) if the stomach is enfeebled; (*b*) if there is much dryness of the stool; (*c*) when the medicine is very unpleasant; (*d*) when it produces nauseative dyspepsia.

Should a purgative not act, or should it not remove the mature humour by its action, it will cause the humour to be distributed throughout the body; the result will be that other humours become changed into the same kind of humour, and the body is flooded with it.

960. There is one of the humours which readily responds to emesis, namely, the bilious ; and there is one which is resistant to emesis, namely, the atrabilious. The serous humour occupies a middle position in this regard.

961. In the case of fever, it is better to purge than to procure emesis. When the humour is passing downwards, as in a case of lienteric diarrhœa, emesis is not advantageous.

962. Among purgative medicines, that is most harmful which is compounded from drugs which show marked variation in their rate of purgation ; for the result is simply confusion. The drug acting more speedily comes into play before the next, and sometimes the one will expel the other before it has come into operation at all.

963. Should a person take some drink which has a purgative action or is emetic, at a time when the bowels are emptied, he is sure to develop vertigo, or colic, and distress. That which finally is expelled will leave the body with the greatest difficulty.

964. Lastly, as long as a given drug gets rid of the superfluities, it will cause no restlessness. If it should cause restlessness, one would know that something more than superfluity is being discharged. Moreover, we shall know when the superfluous humours have actually been got rid of, by the fact that the humour lost by emesis or by purgation is now changed into another kind of humour. The cleansing process of the body will have passed on to a harmful degree if the lining of the intestines is beginning to be lost, and the stool is black with a fetid odour. Also, if a prolonged sleep follows the purging or emesis it will show that the evacuation is complete, and salutary. Also, if there is great thirst after purging or emesis, it shows the purgation is maximal and satisfactory.

965. Purgative medicines expel humours in co-operation with the attractive faculty concerned with the given humour; maybe, attracting the coarse and rejecting the subtle humour. This happens in the case of expulsion of atrabilious humour.

He who asserts the purgative itself gives rise to that which it attracts, or that it attracts first that which is tenuous, is in the wrong. It is true that Galen says so, yet he says accurately that a purgative medicine which is not poisonous, will, if it do not purge or undergo digestion, give rise to the same kind of humour as it ordinarily attracts. However, an assertion of that kind is hardly relevant. It would seem that Galen, in making this assertion, considers that there is an agreement in substance between the attracting drug and the attracted humour, and that that is why they mutually come together. But it is not true to say so, for if like attracted like, then a larger bulk of iron would attract a smaller, a larger bulk of gold would draw a smaller bulk of gold to itself. To discuss this is not in the province of the doctor.

966. You should note that it is the humours in the blood vessels which become attracted by the purgative or emetic. This attraction goes on until they reach the stomach and intestines, which finally expel them in virtue of *their* own nature (i.e., the natural expulsive faculty). It is only rarely that humours which are drawn out by a purgative should ascend into the stomach; if they did, they would be expelled by vomiting. If they should fail to ascend into the stomach, it would be because of one of two reasons—either (1) the purgative medicine has passed on speedily into the intestines ; or (2) having taken the purgative drink, the "nature" proceeds to drive it from the mesenteric vessels to the lower parts of the abdomen and not to the upper parts—because to do so is nearer and simpler, and because there is nothing beyond, which will mechanically impede their progress [i.e., the distal parts of the digestive tube will not compress or block the proximal parts]. This indeed will be evident, considering that the "nature" will act by the shortest route of exit.

967. If the medicine possess an attractive power which will hold the humour, then the expulsive power may still overrule, assuming that the drug only attracts towards the route indicated. An emetic is different in this respect. For, when it reaches the stomach it lingers there, and draws the humour towards itself out from the intestines, and by its own power overcomes the resistance offered by the natural power [of peristalsis downwards].

968. The humours which medicines draw out are usually in the vessels or neighbouring structures, because it is in the veins that the seat of attraction lies. But medicines also draw humours out which are not in vessels, e.g., the lungs ; in this case they are drawn to adjoining organs, like the stomach and intestines, but not viâ the vessels.

969. Remember, too, that it is possible to draw humours from the body by the use of desiccant medicines, using the attraction, for instance, by way of the nostrils. This applies, for instance, in the case of dropsy.

5.—PURGATION AND THE RULES RELATIVE THERETO.

970. In the preceding chapter we have shown that the way to prepare the body for the purgative to be administered is to cause the pores to dilate and the " nature " to relax. This applies specially in the case of " cold " maladies.

In brief, the rule : " soften the ' nature ' before purging " ensures safety in all cases except that of gastro-enteritis. In that case, nothing is to be done, because the disease is itself the cause of the superfluity present.

971. Something of an emetic character must be admixed with the laxative agent to prevent the latter from leaving the stomach before it has done its allotted work. Or, rather, the two ingredients should be so balanced in power that their respective functions shall both come into play (in the right order) —the purgative action in the one direction, the emetic in the other.

972. People who lisp are liable to gastro-intestinal catarrh, and such people do not stand strong purges in consequence. All the same, many do run the risk of gastro-enteritis because of the materials which flow down (" rheums ") from the head.

It is dangerous to administer a purge when the fæcal matter is dried up within the bowels ; in such cases it is best to get rid of it by means of an enema, or by an emollient broth.

973. *Bathing and Purgation.* The use of the bath for several successive days before purgation is a good preparative measure, as it is attenuant. There must be no contra-indication, however. A small interval of time should elapse between the bath and the draught of medicine, and one should not take a bath afterwards because the effect of that would be to draw the morbid material to the skin. The bath is only of use for binding the bowels, especially during winter ; for at that season one need not be afraid of going straight into the first room ; the heat will not interfere with drawing out the humours, and in fact assists in virtue of its emollient effect.

974. Lastly, one should not take the purgative medicine, while in the hot room of the bath (lit. the air of the room should be only moderately warm), lest the medicine should give rise to sweating and a sense of oppression. This is one of the precautions which must be noted.

Other adjuvants, or preliminary measures, are : massage and the inunction of oils.

Avoid the use of violent purges for persons who are not accustomed to take medicine, or to drink it.

Do not administer a medicine to persons who are in a state of "dyspepsia with nausea," or whose humours are viscous, or who have distension of the hypochondrium, or inflammation or obstruction [of channels] in the inward parts. In all such cases, the condition must first be rectified by ordering emollient aliments, the bath, rest (in bed), and by avoiding anything likely to arouse disturbance of, or inflammation in, the humours.

Persons who are accustomed to drink stagnant water, and have enlarged spleens, will need strong aperients.

975. *Sleep and Purgation.* If the purgative used be strong, it is advisable to take it overnight, for by sleeping after the dose, it will act more efficiently. If the purgative be a mild one, it is better not to sleep after the dose, because the vegetative faculty would digest it.

Whether the medicine be strong or weak, one should not go to sleep when it is about to act.

On the other hand, a person should not immediately begin to walk about after taking an aperient. He ought at any rate to rest [long enough] after it to enable the " nature " to embrace it and insinuate itself into it. For unless this insinuation takes place, the " nature " will not be influenced.

976. *Nauseating Aperients.* When a medicine has a nauseating odour, one should make use of aromatic agents, in order to prevent nausea occurring. Examples of these are : mint, rue, celery, quince, Khurāsān earth (Lemnian earth : marginal reading), sprinkling rose water and a little vinegar on them. If a person greatly dislikes the odour of a medicine, let him compress his nostrils. If he dreads the medicine in any case, let him first chew a little tarragon (Artemisia dracunculus), or pellitory (pyrethrum) to dull both taste and smell. If he is afraid of being sick after it, the limbs may be bandaged up, and an astringent taken after swallowing the medicine. In the case of pills, some doctors give them a coating of honey, or boiled honey, or boiled sugar. Another useful artifice is to coat the pills with wax softened in a little oil. Another expedient is to fill the mouth with water or the like, and then swallow the pills with it. Various expedients may be adopted to meet various temperaments or personal proclivities, thus enabling the patients to swallow the drug without being aware of it being a "medicine."

Decoctions should be taken tepid. Pills should be taken with tepid water. If the temperament is cold, the abdomen and feet should be kept warm.

977. When the patient's mind has become soothed in this way, he should take graduated exercise, for bodily movement favours the action of the medicine. After an interval of time, he may take warm water, but not enough to dilute the medicine, or get rid of it or weaken its strength, unless the time has come to arrest the aperient action. The use of hot water lessens the harmful character of the medicine.

If the patient has a hot temperament, and a weak conformation (of humours), and a weak stomach, the medicine should be preceded by some bland tenuous drink, such as barley water or pomegranate juice. Or, speaking generally, the stomach should contain light tenuous aliment. Otherwise it is better to take the medicine fasting.

978. If the purgative is given *in summer time*, fever may develop. Therefore when the person has taken the medicine he should not eat or drink until the medicine has exerted its effect. And if the action is delayed, he should go to sleep unless he wishes to stop its action altogether.

979. If a person cannot tolerate food owing to the stomach being in a "choleric" state, bile readily pouring into it, or if he has had a long extended fast, it is well to take a little bread which has been soaked in a little wine after he has taken the (purgative) medicine and before the bowels have acted ; this measure will help the action of the medicine.—The anus should be laved with hot water and not with cold.

980. Some people assert that if pills are to be administered with decoctions one should select those of like character. Thus, if one orders pills to expel choleric humour, the decoction to go with them must be such as fumitory. Pills chosen for expelling the atrabilious humour require a decoction, for instance of dodder or polypody, or the like. Pills for getting rid of serous humour need a decoction of such as centaury.

981. When the body to be evacuated is dry in nature with firm flesh, a strong medicine like hellebore and its allies, will be needed, taking great care to associate it with unctuous aliments to exert a humectant effect*.

982. Finally, powerful medicines like hellebore are to be avoided because they produce convulsions if the bowels are empty at the time, and also produce irregular disorderly movements in the moistures if the bowels are over-loaded, besides drawing into the intestine things which are difficult to expel. Sour milk will remove the harmful influence in the case of (purgative) herbs having poisonous milky juices, like mezereon and spurge (euphorbia group).

983. A medicine often leaves its odour behind in the stomach, making it appear to be still there. The remedy for this is to partake of a barley ptisan or barley-meal cake, for this will have the effect of cleansing the stomach, and is more efficient than any medicinal powder. Moreover, the ptisan is the best beverage to take if the medicine fails to act, or if one wishes to make the action of the bowels mild and gentle. But if one were afraid about this, it would be better to administer mead, or syrup of honey, or a solution of nitre in water, giving either a collyrium or an enema.

984. *Causes of failure of action of a purgative ;* (*a*) constriction of the passages, due to (1) the kind of temperament ; (2) some lesion of the neighbouring parts. Thus, in the case of persons afflicted with paralysis or apoplexy, the passages of ingress and egress for the medicines are constricted,† and purgation is rendered difficult in such persons.

(*b*) It is dangerous and unprincipled to give two purges on the same day.

(*c*) *Affinity.*—Every purgative medicine which has a specific affinity for a given humour will produce agitation and confusion (disorderly movements, cf. **982**) if it does not reach the humour, and the purgation will be difficult. The same thing happens if a contrary be prescribed with it.

The immediate action of a purgative medicine is to draw out the humour for which it has affinity ; it then draws out whatever humour comes next in amount and in degree of attenuation ; and so on in turn with others, with the exception of blood itself. For the "nature" retains and stores up the blood to the very last.

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* Indiscriminate purgation in dry persons predisposes to phthisis, and to dropsy, if the stomach is weak (Alsaharavius).

† In other words, cardiospasm and pylorospasm, as well as a general contracted state of the intestines, with atony of the longitudinal coats.

(*d*) *Remoteness of humour.*—It is difficult (for a medicine) to draw out a humour from a distant part (of the body).

(*e*) One should see to it that there is not much salt in the food, if one wishes to take a purgative medicine.

If there is a risk of nausea or faintness after taking the purge, it is well to take radish-water as an emetic for two or three days before, and to eat radishes.

985. A draught of medicine may induce nausea, oppression, faintness, fluttering of the heart, griping, especially if it fail to purge or induce sweating. But it is often necessary to induce emesis also, and an astringent is then unnecessary. Barley water may be taken after the purging because it removes the evil effect of the medicine and cleanses out whatever remnants may have been left behind in the bowel.

986. Persons of cold temperament, in whom the serous humour predominates over the others, should follow the purgation by nasturtium which has been rinsed with hot water and oil.

Persons of hot temperament may take fleawort with cold water, oil of violets, conserve of roses, or julep.

Persons of equable temperament may take linseed after the purging.

987. *Undesirable consequences of purgation.* (i) Armenian bole and pomegranate juice remove the *risk of excoriation* of the intestines by the purge. After the medicine has acted, the things we have named should be taken, though they may not be retained.

(ii) If *fever* follows the medicine (" mixture "), barley water is the best thing to take. Syrupus acetosus should not be given for two or three days after the purging, because it is excoriative, and one must wait till the intestines have regained their original strength. But the Hammam may be entered on the second day after the purging, for if there should happen to be any residual humour, the bath will get rid of it. If you find that the idea of a bath is pleasing and that it is agreeable, you will know that the last remains of humour have been got rid of, and nothing more need be done ; but if the patient does not like the bath, and finds it sets up disorderly movements (or restless feeling) of the bowels, it shows there is still something to expel.

(iii) Remember that if the intestines are weak, purgatives excite an *unduly violent and unduly prolonged action*, so that a great deal of medicine is needed to arrest it. The same is true for old persons, in whom purgation is liable to be injurious.

Fever and agitation of the bowels will follow purgation, if wine be taken after the medicine.

(iv) *Pain in the region of the liver* may follow both purgation and blood-letting. This is relieved by a draught of hot water.

988. *Time for taking purgatives.* The time of rising of the greater dog-star; the season during which snow still stays on the mountains; the season of extreme cold—are times when purgatives should not be taken. Medicine should be taken during spring and autumn. Spring is the season during which the snows melt from the mountain-tops. Then comes the summer which is a period during which attenuant agents should not be taken. Autumn is the contrary to spring, and is an appropriate time for the use of attenuant agents.—If a person has to take an aperient in winter he should at any rate make sure the wind is in a southerly direction. Some say that the opposite rule should hold for summer, but there is a difference of opinion about this.

989. Care should be taken not to acquire a habit of taking medicines as emollients for the bowels, for it will prove disadvantageous in the end.

Strong purgatives depress those of dry temperament.

Exercise should be avoided after a mild medicine, lest its potency be impaired. Of weak purgatives, the best are violets with sugar.

When the purgative which a sick person requires does not act, he should not move about more but less.

Purgation may excite movement of the sanguineous humour or make it agitated, and give rise to fever. Blood-letting may be well under these circumstances.

6.—On Excessive Purgation, and the Time Proper for Using Astringents.

990. Thirst is one of the indications that catharsis is to be ended. Therefore, if diarrhœa (from drugs) persists without any thirst one need not be afraid the action is excessive.

But thirst may develop—not from undue purgation, or excessive purgation, but (*a*) because the stomach itself is hot or dry, or both ; for these conditions soon lead to thirst ; (*b*) because of the character of the medicine—it may be pungently hot; (*c*) because the material itself is " hot "—as, for instance, bile. In the case of material of this kind it is not long before thirst comes on. The contraries of these causes delay the appearance of thirst.

If therefore you find that the thirst is excessive and the bowels are acting freely, you may apply astringents, especially if factors which cause thirst to develop quickly are not present. But if these factors are present one should not delay, but use astringents as soon as thirst is evident.

Sometimes the time to apply astringents is shown by the fact of that having been discharged which was intended. Thus if the bile has been discharged and mucus begins to emerge, this shows that the medicine has already acted too much. How much more certain is it that the action has been too prolonged if ordinary bile in the stool has given place to the appearance of atrabilious humour ? or to that of blood—which is still more dangerous ?

If the medicine has given rise to colic, one should proceed to carry out what is said in the chapter on colic.

7.—HOW TO RESTORE A PERSON SUFFERING FROM EXCESSIVE PURGATION TO A NORMAL STATE.

991. The exhaustion which arises from excessive purgation is accounted for by (1) weakness of the vessels ; (2) undue patency of their orifices ; (3) the laxative cleansing out the orifices ; (4) some unhealthy state of temperament arising from the purgation ; (5) other such.

Therefore when the purgation has been too free, bandage up the upper limbs and the lower ones, beginning at the axillæ and groins respectively. Give a drink containing a little theriac or "philonium." If possible, let the patient be made to sweat in a bath or in steam (the head being free, the rest of the body under blankets). After copious sweating has been produced, give massage and let the patient take astringent drinks. Fragrant aromatic liniments should be prepared, using myrtle water, sandalwood, camphor and fruit juices.

The exposed members should also be rubbed, and heat should be applied in the form of dry cupping over the lower ribs, and between the shoulder-blades. If deemed necessary, one may apply plasters prepared with roasted bruised barley and astringent waters over the stomach and intestines. Oils may be used in like manner—for instance, quince oil, oil of mastic.

The patient should be protected from cold air because that helps out (the contents of the bowels) and induces purging ;

and he should be protected from over-warm or hot air because that is enfeebling. He should also be invigorated by the use of fragrant perfumes and by sipping astringents and by giving plain biscuits or rusks soaked in wine of mild bouquet. But all these should be given hot, and before giving them give bread with pomegranate juice, and various kinds of dishes prepared with roasted barley meal and the ground cortices of white poppy.

A tried formula of this kind is as follows : three drams by weight of nasturtium seeds are toasted and boiled in buttermilk until they have clotted. This drink is extremely beneficial.—Astringent aliment such as is made with the juice of sour grapes and the like, and made cold with snow is to be advised. In addition any measure which helps to restrain the movement of the bowels—for instance, the induction of emesis with warm water, keeping the limbs warm with hot water, and not allowing the extremities to get cold. Faintness may be averted with wine, and if this fails to have that effect, narcotics may be given as a last resource, and other powerful medicines which are noted in the chapter on arresting diarrhœa.

For all that, it is far wiser for the doctor to anticipate all such events by having ready lozenges and pungent powders against any need for them, and also to have at hand the appliances for giving an enema.

8.—The Procedure when a Purge Fails to Act.

992. When a laxative fails to act, and induces colicky pains and abdominal distress, so that the patient feels ill, and uneasy, and suffers from impaired vision, dizziness and migrainous headache, with yawning and stretching, one must have recourse to enemas, suppositories or a drink of 2 drams—or 3 kirats—of mastic in tepid water.

The medicine also sometimes behaves in this way because the patient has taken astringent drinks, or has eaten such things as quince, apples. Such things cause tightness of the cardiac sphincter, allay nausea, and forcibly drive the medicine downwards instead of upwards, and they also reinforce the natural faculty.

If the enema is ineffective, and such bad symptons appear as rigidity, eyeballs moving outwards, or retching, then blood-letting will become necessary.

Even if untoward symptoms do not appear in spite of the purgative failing to act, it would still be well to do a blood-letting in two or three days, lest the morbid humours should pass into one of the vital organs.

9.—The States (Hāl) of Purgative Medicines.

993. Some purgative medicines are very malignant in character. For instance: black hellebore, the yellowish kind of turbith (which is not good, like the white variety); agaric—the blackish kind instead of the white and pure kind; mezereon.

Inasmuch as these are harmful, if they are taken and evoke bad symptoms, it is best to get rid of the medicine out of the body as soon as possible, by means of emesis or diaphoresis, and give antidotes such as (rotted) yellow turbith. The evil character of many of these drugs and the mental disturbance they give rise to, may be removed by taking excessively cold water, or by sitting in it.

Beneficial for this also are (medicines) which antagonise the acuity (of the purge) by glutinosity, unctuousness and soothing character.

994. Some medicines are compatible with certain temperaments, but not with others. Thus, scammony will act only feebly if at all when the patient is living in a cold climate, unless a large dose be administered; so this is usually done in the land of the Turks. In some countries, too, one must introduce into the body only the properties of the medicine, and not the actual substance.

995. Medicines of pleasing odour must be mixed with purgatives in order not to risk loss of strength in the members. Cordials are good adjuvants, for they reinforce the vital breath in every member in addition to their action in virtue of their tenuous nature and ease of penetration.

Two medicines are sometimes combined, one of which expels its corresponding humour rapidly and the other slowly. In this case the one will complete its action after confining the other in its corresponding humour, and then impairing its power. When in due time the second comes into play, it does so in a feeble manner, so that ineffective straining movements occur. Something must therefore be admixed to help and hasten its action. Ginger will serve in the case of turbith, because it does not dull its action. You must learn how to mix them properly in order to produce this effect.

Besides this, you must take into consideration all those principles which we have set forth in speaking of the properties of purgatives (laxatives), under the heading of the general principles regarding the use of simples.

996. Purgatives act in virtue of five kinds of property : (*a*) a specific resolvent property (e.g., turbith) ; (*b*) power of expression (e.g., myrobalan) ; (*c*) lenitive property (e.g., manna) ; (*d*) lubricant quality (e.g., mucilage of fleawort ; prunes ; [liquid paraffin !] ; (*e*) a certain poisonous character, in the case of the violent purges, which itself produces the purgation by direct aggressive action upon the natural faculty. Consequently such properties should be met by associating medicinal agents endowed with the virtues of bezoar stone [specifically antidotal for poisons]. Bitterness, sharpness, pungency, astringency, and sourness help the action of a medicine in which that particular kind of property is present. Thus, bitterness and sharpness help the resolvent property; pungency and astringency help the expression ; sourness helps the incisive property (e.g., of mucus) and paves the way for lubrication.

997. To ensure a lubricant action, one must not combine the drug with one having expressive power, in such a way that both properties are simultaneous and equal ; they must be arranged so that the one property does not come into action till after the other. Thus of two medicines, the lenitive one should be able to exert its own function before the one with the function of expression ; the latter will then act after the lenitive effect has been produced. The same principle applies to the other cases.

10.—List of Topics Belonging to this Subject which are to be Found Dealt With Elsewhere.

998. Purgative and lenitive epithemes and potions, and so forth, are deferred to the Formulary (Book V.) Under "Simples" we give the rules for modifying the respective simples according to the age of the patient ; how to assist their action, how to administer them in fluid form.

Pills must not be given if they have become so dry as to be as hard as stones ; and they must not be given in a soft state lest they should be absorbed and held within the body. The proper time to give them is when they are just beginning to get dry, and yet yield to the pressure of the fingers.

11.—On Emesis.

§ 256. *What is meant by emesis.*—The act of vomiting may occur (*a*) from errors of diet ; spontaneously (*b*) from a diseased condition either in the stomach or elsewhere; (*c*) by deliberate induction. This chapter is concerned with the last-named. There are two types of emesis under this heading: (*a*) where a single act of vomiting is aimed at—the stomach being emptied of its contents, whether food merely, or contained humours, or humours drawn into it by a preparatory process of treatment; (*b*) where the vomiting is to go on for a period of time—for instance, more than an hour, on the permissible assumption that a single act will not necessarily subside much sooner than an hour.

(N.B.—The text has been slightly re-arranged in order to obtain a more consecutive picture.)

999. *Contra-indications.*—Men who are difficult subjects for the procuring of emesis are:

(i) So *by nature;* contracted chest; bad method of breathing; long, thin neck; [prominent chest, Rhazes]; lean habit—for in such persons the bile should be adequate; liability to hæmoptysis; liability to throat inflammations [i.e., pharyngo-tonsillitis]; persons with poor digestion ("weak stomach"); very obese subjects; those with weakness of vision; epileptics. In such cases it is better to use purges instead.

(ii) So *by custom.* Such persons are not accustomed to be sick, and if vomiting be induced by powerful emetics, the effect will not last, and the vessels in the respiratory organs will be liable to burst, and "phthisis" will develop.

Another contra-indication.—*Pregnancy;* for the menstrual superfluities in such a person will not be got rid of, and the great exertion entailed in the emesis may lead to restlessness. One must allay the vomiting (should it occur during this period). In other cases, vomiting may be encouraged.

1000. *Objects in View.*—[To prevent indigestion after immoderate eating; to remedy intoxication after immoderate consumption of wines; to evacuate phlegm or mucus from the stomach; to lighten the head. (Aeg.).]

The immediate intention is to empty the stomach alone, and not the intestines. The remote intention is to relieve the head and finally the whole body of humours which are drawn down and got rid of from the upper parts.—And you know that the emesis has been beneficial when it is followed by relief, good appetite, good breathing and normal pulse; and by noting the condition of the other functions of the body.

The treatment of chronic maladies. The following chronic maladies are benefited, such as:—dropsy, epilepsy, [jaundice: Aetius]; melancholy, leprosy, [arthritic diseases: Aetius]; gout, sciatica.

1001. *Procedure.*—When one is unaware as to how a given person will respond to an emetic, one should first give a mild one, and not venture on a strong one like hellebore and the like until after the effect of the former has been observed. Should the first one not agree, and it be still necessary to administer an emetic, one should adopt preparatory measures in order to get him accustomed to it. Thus, one orders some emollient articles of food, made unctuous and sweet ; and then to desist from exercise, and then take oil with wine ; then give good food, especially if vomiting is difficult to induce, for if it fails it is better that the food still in the stomach should be good than bad. The patient should not masticate the food much which he is taking before intending to procure emesis.

1002. *Rules regarding the food to take after emesis.*—If the vomiting continues even after the contents of the stomach have been emptied, the next meal should be postponed until the patient is very hungry. The thirst should be allayed with a drink of undiluted syrup of apple or the like, but not with julep or syrupus acetosus, because these would themselves have an emetic effect.

An appropriate dish is the special one prepared with fowl; viz., first boiled awhile and then roasted before the fire. Three glasses of wine should be taken after it.

The meal should be postponed to midday, and be preceded by a drink of hot rose water if the vomitus be unusually sour, and the pulse is suggestive of fever.

Should the vomitus be very dark bile, a sponge soaked in hot vinegar should be applied over the stomach, and the next meal should consist of something different from the foods taken to procure vomiting, for to use the same kind of food would simply fill up the stomach and excite it to discharge the food.

If the vomiting has been copious, the best thing to give is small birds such as chickens or pigeons which are just beginning to walk. But the patient must take care not to eat up the leg-bones, for these are heavy for the stomach, and will remain in it a long time.

1003. *Articles of food, etc., which facilitate or induce emesis.* Almonds dipped in honey and the like ; barley water taken with its faex and honey ; fresh pennyroyal ; confection of bruised beans ; decoction of radishes ; decoction of narcissus bulb (Aeg.) ; herb rocket ; cucumber root boiled in honey (Aeg.) ; green marjoram (Mant.) ; leeks ; meat-fat swallowed in lumps (Aeg.) ; oil of privet (Aetius) ; old pickles [onions, ptisan of pulse made with honey ; rocket ; moistened pompion seeds and cucumber seeds pounded with honey ; sweet cakes ; sweet wine ; tepid drinks ; (Aegineta)] ; tepid chamomile tea ; water with butter, and the like.—A special dish prepared with unleavened bread, oil, melon, cucumber in its seeds or the roots well ground up, and infused in sweetened water ; soup made with radish.

A person may elect to use intoxicating wine to procure emesis, but it will not do so unless a large quantity be drunk. Ale, also, may act as an emetic, provided it be combined with honey, and is taken after a bath. It will also prove purgative as well.

A strong emetic like hellebore should be taken fasting, unless there is some special contra-indication, and it should be taken after the second hour, and after the bowels have been emptied.

1004. *Methods of assisting the act of vomiting.*—The use of a feather will incite the movement. If so, good ; if not, the patient should walk about a little ; and if that fails, he should go into the bath. As midday approaches, let him do running exercises. The feather with which vomiting is induced should be anointed with, for instance, henna oil. [The throat may be tickled simply with the finger, which should be smeared with iris ointment. Aeg.] Should distress in the stomach, and spasms arise, let the patient take a draught of hot water, or of olive oil, for that will either bring on vomiting or empty the bowels.

Another way of helping it on is to apply warmth to the stomach and extremities, because this will induce nausea.

At the time of vomiting, it is a help to bandage the eyes with a double turn of bandage ; and a light binder may be applied round the abdomen.

If the effect of the medicine comes on precipitately, the patient should keep still, inhale pleasant odours, have his limbs rubbed and compressed ; a little vinegar should be given as a drink, and he should chew apple and quince with a little mastic.

Moving about makes vomiting worse ; repose lessens it.

Nausea is the first premonitory symptom. [Then profuse salivation.]

1005. *Ill-effects produced by vomiting.* The worst effect which may happen is intense spasm of the stomach, and a burning in the stomach. This occurs if a violent emetic like hellebore be taken. It first produces salivation, after which a copious discharge of watery fluid appears, and finally a viscid or slimy fluid. The colicky pain persists, and the other symptoms pass on to nausea and distress, which increases. The bowels may begin to act after the movements of the stomach have quietened down and the patient has lain down to rest.

1006. *Ill-effects produced if the emetic fails to act.*—If vomiting does not occur and the distress increases, and distension occurs, and the eyes start out, and get very red, and profuse sweating comes on, and the voice fails, death will ensue unless something is done.

The best thing to do in this case is to give an enema, which you must have ready beforehand, and a dose of honey prepared with hot water. In his drink, the patient should have some oil of antidotal character, like oil of lilies ; and this should be persevered with until emesis occurs ; he will not choke with it.

Difficulty of vomiting may arise because the humours are too tenuous. In such a case, they must be thickened, so barley meal is taken which has been made into a cake with cooked pomegranate seeds.

1007. *Ill-effects often resulting from vomiting in any case.* Sordes form in the mouth and round the teeth. Deafness may come on. While emesis benefits the body, it is injurious for the eyes (and see **1011.**)

The sign that the cause of the nauseative satiety is passing down away from the stomach is that it is being expelled by the bowel after the vomiting is over.

If purgation is followed by vomiting, it shows there is something still to be expelled.

Blood-letting must not be done consecutively upon emesis. One should allow three days to elapse, especially if there is any heaviness in the pylorus, or if there is a humour lodged there.

1008. *Proper time for procuring emesis.*—The summer-time is the most appropriate season for inducing emetic treatment, and if a person had to undergo a course of emesis, whose physique (see **999**, i) is not appropriate for this kind of treatment, the summer is the best time in which to undertake it.

The best time of day in summer is midday, because the air is then hottest.

12.—THE TREATMENT FOR ARRESTING VOMITING.

1009. The procedure to follow in order to arrest vomiting is to rinse the mouth and to lave the face with water, to which vinegar or sour wine has been added, for this relieves the aching of the head. A little mastic may be taken in apple-water or cyder. [A cup of black coffee may be given. Aeg.] He should abstain from food and water. He should take a long rest. The abdomen should be anointed [or a mustard plaster applied over the epigastrium. Aeg.] He may enter the bath, and make his ablutions rapidly and leave it quickly.

If it is necessary to give any food, let it be of good flavour, substantial and readily digestible.

Annotations by Costaeus to this chapter refer to *sea sickness.* In this case, if much bile is being brought up, all food should be stopped, or only the merest taste of light food allowed. If the vomitus consist of phlegm, light food may be allowed. The reason is that in the former case there are sure to be remnants of the unhealthy humour left behind in the stomach. If the vomitus consisted of mucus or phlegm, one knows the stomach is empty, and one may consider whether one should leave the stomach devoid of food or not.

If the emesis is the result of a medicine, food must not be taken unless the stomach is weak, in which case one may give a little light food with three glasses of cold water.

13.—THE ADVANTAGES OBTAINED BY (THERAPEUTIC) EMESIS.

1010. Hippocrates advised vomiting to be induced monthly and for two consecutive days. On the second day the difficulty of the first day is obviated and that which has entered the stomach is fully emptied. Hippocrates claimed that health was conserved thereby. To exceed this would be harmful.

Emesis carried out in this way gets rid of mucus and bile, and cleanses the stomach. For in the case of the stomach there is no cleansing secretion like that for the small intestine—where the bile cleanses the mucous membrane as it passes down the bowel.

Emesis clears heaviness of the head ; clears the vision ; removes nauseative dyspepsia. It benefits persons in whom bile is apt to pass into the stomach and decompose the food. For, if vomiting precedes the meal, the latter will always enter the stomach without being contaminated, and so the sense of loathing is removed which proceeds from oiliness of food, as also the depraved appetite—namely, the longing for sharp, sour, or pungent things.

Emesis is also beneficial for flabbiness of the body, and for ulcers of the kidneys and bladder. It has a powerful effect in (anaesthetic) leprosy ; in persons with an unhealthy colour of skin ; in gastric epilepsy, jaundice, asthma, tremor, hemiplegia. It is also an effective treatment in cases of impetiginous skin diseases in which there are ulcers covered with scabs.

It should be procured once or twice a month—after a heavy meal. It is well not to follow fixed time intervals.

Emesis is a great help for persons whose temperament is primarily bilious, and who are lean of habit.

14.—The Evils which Follow on too Frequent Emesis.

1011. To procure emesis to an undue degree is injurious for the stomach, and weakens it and renders it susceptible to (noxious) matters. It is prejudicial to the thorax, and to the vision, and to the teeth. It is harmful in cases of long-standing pains in the head, except when these are due to gastric disorder ; and in cases of " epilepsy of the head " when the cause of this is not in the lower limbs.

The superfluity which explains the excessive emesis is injurious for the liver, the lung, and the eye ; and it may lead to rupture of blood-vessels.

The custom of some people of eating to excess even beyond that which the stomach will tolerate, and then procuring emesis [to enable more to be taken] is one of the things which ends in chronic disorders. Such persons must be advised to cease the habit of repletion, and must take measured amounts of food and drink.

15.—How to Remedy the States Incident on Emesis.

1012. We have already given methods for arresting vomiting.

Tightness and pain under the hypochrondrium are relieved by applying upon the stomach-region cloths wrung out of hot water, by the use of lenitive oils, and by dry cupping (using fire).

Persistent Spasm of the stomach is relieved by taking greasy, easily digestible broths ; the area should be anointed with oil of violets admixed with oil of mallows [variety not stated] and a little wax.

Hiccough : If this is persistent, give a sternutatory, and sips of hot water.

Hemetemesis : This is referred to in the next chapter.

Lethargy, spasmodic diseases (including lockjaw), "cold" maladies, loss of voice.—In such cases bandage up the extremities tightly, apply a cloth over the epigastrium wrung out of oil in which rue and cucumber (agrestis, or asininus) have been boiled, and administer honey in hot water as a drink.

Drowsiness, or swooning (trance).—This is treated in a similar way, and the oil is also instilled into the ear.

16.—CONCERNING EXCESSIVE VOMITING

1013. Let the sufferer sleep, and as long as he can. The extremities should be bandaged in the same way as one does for arresting diarrhœa. Over the stomach apply invigorating astringent plasters.

If the vomiting is so violent that humours are continually being discharged and even blood comes, milk should be given, mixed with wine, to the amount of four glassfuls, because this antagonizes the evil quality of the medicine, and arrests hæmorrhage and soothes the "nature." If you wish to clear the blood from the breast or stomach so that there is no risk of it clotting, administer syrupus acetosus in small doses, making it with honey or sugar, and making it icy cold by means of snow. Liq. ext. purslane taken with armenian bole, is also beneficial in some cases.

If you are afraid a person has taken too much medicine of any kind, purgative or otherwise, procure emesis.

Emetic medicines are to be selected according to their degrees of potency, and according to the mode of administration applicable to each. These points, and especially the use of hellebore, are dealt with in the Formulary (Book V) and under "simples."

§ 257. Annotation by Costaeus: The object underlying some of the above measures is to centralise or concentrate the life-breath in the interior of the body (i.e., round the solar plexus) and prevent it from being disseminated over the body, in which case there would not be enough in the vital centres to maintain life.

17.—ON ENEMAS

1014. The enema is an excellent agent for getting rid of the superfluities in the intestinal tract, as well as for allaying pains over the kidneys and bladder, and for relieving inflammatory conditions in these organs; for relieving colic; and for drawing superfluities from the vital organs of the upper parts of the body. Such acute superfluities impair the function of the liver, and are apt to produce fever.

Among the advantages of enemas is the fact that by their means the remnants or residues of the evacuants which are left behind are cleared away.

[Enemas are useful to relieve constipation, when the stomach is weak and will not tolerate purges. Aeg.]

Form of enema; the method of giving an enema—see the chapter on colic in Book IV.

Best posture for giving an enema.—First lie supine; then turn over on to the painful side.

Best time for administration.—When the air is cold; because heaviness, pain, restlessness and nausea do not then supervene; or, if present, they will decrease.

The use of the bath in regard to the administration of enemas.—The purpose of the bath is to arouse movement in the humours, so that they may disperse. The property of the enema is to draw out gases and the imprisoned humours. For this reason it is best that the bath should not precede the enema. In a case of intestinal ulceration, if a bath were necessary to relieve the fever or any other symptom, the risk which there is of the enema being retained would be met by applying a poultice of hot millet or frumenty over the epigastrium and umbilicus, or over the anus and thigh.

§ 258. MATERIALS FOR MAKING ENEMAS.

If the humour in the intestine is sero-mucous: give beet, decoction of dried figs, dill, honey, nitre, root of wild cucumber.

If the enema is used to remedy undue dryness: give marshmallows, fenugreek, chamomile, oil, or small quantities of honey—all of which are emollients. A half hemina of oil (a half-pint) may be given. (Aeg.)

The addition of honeyed water makes the mixture more efficient than plain water. The mixture must, of course, be tepid.

Astringent enema: vervain (Celsus).

Acrid enema: sea-water with or without oil, nitre or honey. This kind of enema is very drastic and painful. (Celsus).

The patient must resist the first desire to go to stool. (Celsus).

§259. The modern usage is much more simple. Plain water, soap-suds, or thin gruel is the usual base, and the amount to introduce is from a half to three half-pints of fluid. To either of these bases may be added one ounce of castor oil or glycerin, or castor oil with a half-ounce of turpentine. Olive oil is sometimes used (6-10 ounces). Half-ounce injections of glycerin are also popular.

18. ON LINIMENTS

1015. Liniments are among those useful remedies which reach the diseased condition itself. They belong to two groups (1) fluid, (2) viscid. The former are more often required than the latter. If the viscid variety is used to modify the consistence of the fluid variety, a plaster results. The fluid portion will then penetrate to the affected part, the viscid portion remaining behind. It is the penetrant part which is beneficial. Example: making a plaster with coriander and crushed barley, for application upon scrophulous lesions.

Plasters are akin to liniments, but are solid, whereas the latter are fluid.

Cloths may be impregnated with liniments, and then applied over the important organs (liver, heart), if there is no contra-indication. Cloths impregnated with crude xylaloes are useful, for they impart an agreeable odour which helps the efficacy of the liniment.

19.—Douching or Spraying

1016. Douching [over the head, usually] is a method of treatment applicable when there is something to be dispersed from the head or other members. It is also applicable for the purpose of altering the temperamental state of a person, when that is necessary.

In applying the douche in cases where superfluities have not passed into organs or members, one first prepares it with hot water, and afterwards with cold water, in order to produce an astringent effect. If the state of affairs is otherwise, the cold application is used first.

Note that douching over the head may be done from a jug or similar vessel, or in the form of a spray or shower. The fluid may fall from a height, or close to the part. The part treated may be the head, or a limb, or other part. The fluid employed may be plain water, or medicated. If medicated, it may be mineral or herbal. If mineral, artificial or natural.

20.—On Blood-Letting (Venesection).

The matter in this, the longest chapter in the whole volume, has been re-arranged and partly abridged.

1017. Blood-letting is a method of general evacuation. It removes the excessive quantity of humours present in the blood vessels.

1018. *General indications.* Blood-letting is only applicable (1) when the blood is so superabundant that a disease is about to develop; (2) when disease is already present. The object in both cases is to remove the superabundant blood, to remove unhealthy blood, or both.

Cases coming under the first category are such as the following: incipient sciatica, podagra, or any arthritic disease due to abnormal blood-state; danger of hæmoptysis from rupture of a vessel in a rarefied lung, for superabundance of blood then makes the vessel liable to give way; persons on the verge of epilepsy, apoplectic seizure, melancholia with superabundant blood, pharyngotonsillitis, internal inflammatory masses, "hot" ophthalmia, persons with piles which generally bleed but now do not; women who fail to menstruate, but do not show the two colours indicative of a need of venesection, because they are so dusky, or pale, or greenish. Persons who suffer weakness from the hot temperament of the interior organs. (In these cases it is best to do the blood-letting in spring.)

Cases of severe blows and falls need bleeding for fear of an inflammatory mass developing (for there is a risk of causing the latter to burst before it has matured), provided there is no urgency and not too much blood in that part.

Remember, too, that blood-letting is safer when the maladies to be feared have not yet befallen the patient. It must be avoided in the initial stages of a disease because it renders the humours tenuous, and makes them become dispersed throughout the body and come to be admixed with healthy blood. Sometimes it happens that the venesection does not remove what was desired, and it would have to be repeated—which would be enfeebling. Once the maturation stage has been passed, the disease having passed its initial stage as well as acme, blood-letting is to be done unless there is some contra-indication.

Phlebotomy is necessary in the case of a person who sweats profusely from repletion.

1019.—*Contra-indications. Age*: Not before 14, or after 70. Young adults should be gradually introduced to it by beginning with small blood-abstractions.

(2) *Physique*: those who are very emaciated; those who are corpulent; those who have flabby muscles; those whose colour is white or yellow; those who have often been ill.—An exception may be made in the case of adolescents and old persons, if they have firm muscles, full veins, have a red colour.

(3) *Physiological states.*—The following are contra-indications: (i.) a state of repletion with food; the stomach full of food; the bowels still loaded with fæces; a state of nauseative satiety; a state of sensitiveness of the pylorus, or weakness of the sphincter. Explanation: if the stomach is full, the effect of the venesection will be to draw imperfectly digested matters into the veins to replace the loss from the vein. If the bowels are full, the veins of the intestines will suck in putrid matters from the fæces. In the former case one waits till the food has had time to pass on; in the second case, the bowel is emptied by emollient enemas. In the case of nauseative satiety, one must wait till it passes off.—(ii.) A state of fasting. When the pylorus is relaxed and the bile runs into the stomach, producing gastric pain, persistent nausea, vomiting, and a bitter taste in the mouth (for by these signs you know of the condition), beware of letting blood in the fasting state. (iii.) Tenderness of the pylorus.—One knows that this tenderness is present, because pain is felt during the passage of acrid substances through it.—(iv.) Pregnancy.—Avoid letting blood from a pregnant woman unless there is grave necessity, such as the need for arresting hæmoptysis, and even then not unless the strength is sufficient. (v.) Miscellaneous.—A resolvent bath should not have been taken shortly before. Coitus should not precede. A cold temperament is a contra-indication. Caution is requisite in the case of persons living in cold countries.

(4) *Pathological conditions.* (i.) Humoral. It is not necessary to let blood every time you find the signs of plethora which we have given, or rather where there are signs of repletion with immatured humours. In such a case venesection would be very disadvantageous, because blood-letting would incur the risk of their not maturing, with consequent risk to the life of the patient.

It is a good practice to let the blood of a patient with excess of atrabilious humour, and to follow it up with a purge. But you must carefully watch the colour to judge of the patient's condition, and also the tension, because it is from the state of tension in the whole body that one can best judge of when to employ venesection. So if a person's blood is good and scanty, and his body contains many bad humours, venesection would extract the good blood and leave the bad humours behind. If the amount of bad blood were scanty and something passed down into a member which markedly interferes with the downward passage of the bad blood into it, and it became necessary to do a blood-letting, one should only take a little, and give the patient good food, repeating the blood-letting after a few days. It will then be possible to abstract the bad blood and leave the good behind.

If the blood contain unhealthy bilious humours, the proper thing to do first is to purge with a tenuous laxative, or use an emetic, or give sedatives and order rest and inactivity.

If the humours are gross, the ancients advised the patient to take a bath, and pursue his ordinary occupation. Both before and after venesection, and before any other form of depletion is undertaken, he was to take drinks of an attenuant syrupus acetosus, in which hyssop and thyme had been boiled. If done unnecessarily phlebotomy simply sets the bilious humour in motion,—shown by dryness of the tongue, etc.

(ii.) Colic. (iii.) When the disease is on the move, neither venesection nor purgation is to be done, because that is the time when rest is to be ordered, and sleep is to be aimed at ; it is the time when the malady will bestir itself. (iv.) Febrile states.—Note that blood-letting may be quite unnecessary in fevers. If there is not much "matter," the "nature" will overcome it unaided. One ascertains whether this is likely by studying the aspect of the patient, his age, his strength, and the like.—When the fever is high, or when there is inflammation, blood-letting is avoided. Also if there is a severe rigor ; and if there is spasm or if there are convulsions. In all such cases, bleeding would deplete the treasury of blood, with resultant weakness. Moreover, if a febrile person, with headache, suddenly develops a diarrhœa, phlebotomy, though likely to benefit up till then, has become superfluous. (See also **1029.**)

(v.) Critical period of an illness.—When the crisis has been reached and it is of long duration, one must in no wise remove much blood. If possible, procure rest. If that is not possible, a small blood-letting may be done, reserving the treasury of the blood for a subsequent venesection if such prove to be necessary, and also conserving the patient's strength for undergoing the critical stage. If a long time has elapsed since the blood-letting was done, and if there be a complaint during the winter season, of a feeling as if one is broken in pieces, one would just do a blood-letting without touching the main bulk of the blood for the present.

(vi.) Enfeebled strength.—If the strength is enfeebled by having much recourse to blood-letting, it will result in the formation of many humours.

1020. *The proper time of day for venesection.*—There are two occasions when venesection may be done ; there is the time of election, and there is the time of necessity. The time of election is before mid-day, after digestion is completed and when the bowels are empty. In the other case, the need for the relief of venesection is too urgent to wait for the other favourable conditions. (Days of election : as with evacuants generally ; q.v.—and "southern" days.)

1021. *Vessels which may be used for blood-letting.*

Both arteries and veins may be used for blood-letting. But arteries are avoided because of the risk of not being able to staunch the blood, and if a small hole be made, an aneurism may result. When there does not appear to be this risk, the use of an artery gives better results in some diseases, unless they are situated in the vicinity of the artery to be tapped, for that would make the blood thin and hot. The artery to be selected must be near the diseased part [in the case of chronic conditions, in the opposite region in acute cases (Aeg.)].

1022. *The veins of the upper extremity.*

Six of these are made use of : the cephalic, the median, the basilic, the funus brachii, the vein between the middle and ring finger and that between the thumb and index finger. The cephalic is much the best to use. The *parts drained* by these various vessels are as follows : The cephalic vein drains from the neck, and parts above that, but very little from the parts below, and none from the liver and hypochondrium, or from the lower limbs. The basilic vein draws blood from the abdomen and parts below. The median vein draws blood from regions intermediate between those drained by the cephalic and basilic. The funis brachii drains the same parts as does the cephalic. The vein between the right middle and ring finger is used for conditions of the liver. The left one is used for disorders of the spleen. The blood from these veins readily clots, so the patient should put his hand into hot water to keep the blood flowing longer, and to help it to emerge better if inclined to come out too scantily. (The incision in these two veins should be longitudinal.)

The vein between the thumb and index finger, on the right side is used for similar purposes as the basilic. It is useful in cases of chronic hepatic pain, and very efficient in disorders of the diaphragm (as Galen perceived).

An artery may be used which goes to the inner part of the palm, and is nearly as effective.

1023. *The veins of the head.*

(i) The frontal veins. These are between the two eyebrows. Phlebotomy in this situation benefits heaviness of the head, especially occipital heaviness; heaviness of the eyes; long-standing headache.

To make these veins swell, apply fomentations, and also a bandage round the neck, placing a finger over the windpipe to prevent suffocation. (Aeg.)

(ii) The supraoccipital veins. Bleeding here is beneficial for megrim, and ulcers of the scalp.

(iii) The temporal veins, which are tortuous.

(iv) The two veins at the lachrymal angle of the eyes. These can only be rendered visible by compression of the neck in partial suffocation.

Use: in headache, migraine, chronic ophthalmia, pannus, trachoma, blepharitis.

Precaution: do not cut deeply lest a fistula be set up, by striking the bone. Moreover in such an event very little blood will emerge.

(v) Three small post-auricular veins, found at the point which the tip of the ear touches when pressed back against the hair. One of the three is more conspicuous than the others, and this is opened in cases of glaucoma, ulcers of the ears, neck and back of the head.

(vi) The veins behind the ears below the nuchal protruberance. This is beneficial for chronic eye diseases due to thin blood, and for chronic headache.

(vii) The vein at the tip of the nose. It may be made obvious by pressing the finger upon the tip of the nose so as to make it groove into two. Very little blood will come from it. (Aeg. advises the inside of the nostrils to be rubbed with the end of a specillum, or to be tickled with a rough substance.)

Use: for freckles, for dimness of vision, pimples in the nostrils, itching of the nostrils; for piles.

Ill-effect: a permanent serpiginous redness of the tip of the nose may result, which spreads out over and disfigures the face, so that the remedy is worse than the disease.

(viii) Labial veins. There are four. Use of phlebotomy here: for ulcers of the gums; aphthæ; (septic) gingivitis, flabby gums, ulcers, fissures and fistulæ in the gums.

(ix) Sublingual vein. This is used in cases of angina, and tonsillar abscess. Supra- and sub-lingual veins are used in cases of heaviness of the tongue due to congestion. The incision must be lengthwise as otherwise it is difficult to staunch the blood.

(x) A vein at the lowest part of the lip. This is opened in order to relieve fetor of the mouth. It is situate between the chin and lower lip.

(xi) Veins of the gums: these are opened when wishing to act on the mouth of the stomach.

(xii) The jugular veins. The instrument to use here is one with a sharp point. Technique: draw the head to the opposite side until the vein is stretched like a cord. Consider in which direction the vein is likely to slip, and then make the opening accordingly. The incision must be transverse. (Aegineta says: use the concave part of the scalpel.)

Use: at the onset of lepra; in severe angina; in dyspnœa, in " hot " asthma, in hoarseness; in abscess of the lung; in dyspnœa due to superabundance of " hot " blood; in diseases of the spleen and side.

1024. *The arteries of the head.*

The following may be opened. (*a*) The temporal arteries. These are sometimes phlebotomized, sometimes incised, sometimes drawn out, sometimes cauterized. The object is to influence watery matters in glaucoma. (*b*) The two post-auricular arteries. This is for treating some forms of ophthalmia, incipient glaucoma, pannus, dimness of vision and long-standing headache

There is always the risk that coagulation will be very slow.

1025. *The veins of the trunk.*

There are two to be found coursing over the abdomen. One runs over the hepatic region, and the other over the splenic. The former is opened in cases of dropsy, the latter in diseases of the spleen.

1026. *Bleeding from vessels in the lower limbs.*

(i) The sciatic vein. This vein is opened in the region of the malleolus. The bandage is applied above, anywhere between the prominence of the hip and the instep. It will have to be applied tightly. The limb should be bathed in hot water first. The incision must be longitudinal.

Contingencies.—A deep artery, or one difficult to find : in this case use one of the branches, such as that which runs between the little and second toe.

Value.—In cases of sciatica, podagra, varices, and elephantiasis.

Repetition.—It is difficult to do a second phlebotomy.

(ii) The saphenous vein. This is opened over the internal malleolus, above the instep. It is more conspicuous than is the preceding. The incision must be transverse.

Value.—For emptying the blood from the organs below the liver, and for causing the blood to descend from upper parts to lower ones. It is a powerful aid for the menstrual flow. It opens up the pores of piles. While one would expect either vessel to be equally efficacious, experience actually shows that the use of the sciatic vessel is more beneficial for sciatic pain.

(iii) The popliteal vein. This is opened behind the bend of the knee. It is as effective as opening the saphenous vein. For exciting the menstrual flow, however, it is even more efficient, as well as for pain from piles, and pain in the anus.

(iv) The vein over the heel. The use of this is similar to that of the saphenous, of which it is a branch.

(v) The vein over the inner toe : this may be used in cases of sciatica and uterine disease. (Aeg.)

In brief, the veins of the lower extremity are used in cases where matters descend from the head, and for disorders connected with the atrabilious humour.

Phlebotomy from the feet is more weakening than that from the arms.

1027. *Procedure in blood-letting.* (a) *Pre-operative treatment.* The stomach requires to be previously fortified, as there is a risk of death otherwise. If the stomach is weak and sensitive, give pieces of bread soaked in a rob made with a vinegar of good odour. If the person is also of cold temperament the bread should be dipped in sugar water with aromatics, or a syrup of spearmint perfumed with musk. If bile is regurgitating into the stomach, induce vomiting with plenty of hot water containing oxymel. Then give the soaked bread, and do not delay with the operation.—It is disadvantageous to take a bath prior to the blood-letting, because it makes the skin thick and soft, and the operation is difficult unless the blood is thick.

(b) *Instrumentarium.*

I. Several scalpels.	Some with broad point, others with narrow.* The latter are best for mobile veins like the jugulars. See that the point is intact, lest you miss the vein or cause pain, or do injuries which lead to sepsis.
II. A ball of silk or thread.	
III. An instrument to excite vomiting, made with a feather or of wood.	Used if vomiting is not spontaneous.
IV. Rabbit-hair.	Used as styptic in arterial hæmorrhage.
V. A medicament of aloes and frankincense and a musk electuary.	Used to keep the preceding in place. Also for syncope.
VI. Lozenges of musk.	For syncope ; musk is given to smell for the same purpose.

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* The tip should be long enough to reach the vein without touching other structures.

(c) *Make the veins stand out.* A band is tied round the limb for this purpose. The artery may swell also, in which case the tourniquet should be loosened, and the swollen vessel rubbed. If the swelling reappears on tying the band, abandon that vessel and turn to the vessel running over the elbow. On the other hand, a bandage may obliterate the arterial pulse and lead to a risk of opening this in mistake for the vein. If the vein remains difficult to see, relax and tighten the band alternately, and rub the vein down and up, up and down, using two fingers for this, for then the stationary finger feels the blood run in which the other finger forces down. With very thin veins this will need repeating several times. The band must be adapted according to the coarseness of the skin, the amount of fat and size of the muscles. If the band conceals the visible part of the vein, a mark should be made along the line of the vessel, to enable it to be found afterwards.

(d) *The incision.* Take hold of the scalpel between the thumb and middle finger, so as to leave the index finger free to feel the place to incise. Grasp the knife by the middle and not by its end, so as to have proper control of the blade. The point should be so sharp that it will enter the vein by a gentle coaxing. To have to keep on poking the knife about to find the vein will only do injury. The blade should have been dipped in oil, and the area of skin should have had oil gently rubbed into it.

The incision into the vein should be longitudinal, to render clotting less likely. The opening should be well above the level of the joint. If made at the level, the blood would not come out freely, and the risk of injuring the nerves and arteries is great.

(e) *Possible mishaps.*—(i) Injuries to the vein opened. Since the venesection has to be repeated on some future occasion, the vessel must not be unduly injured ; repeated blood-letting is likely to injure it ; hence a second operation should be done at another spot, thus averting risk of inflaming of the part. (ii) Injuries to other structures. When using the median vein, the nerve is in danger. There may be two nerves in the way. Hence one should cut downwards and lengthways. The nerve may lie over the vein, tense like a string, and injury to this, thinking it is the vein, will lead to permanent numbness of the fingers. The more distended the vein, the more prominent is this aberrant nerve. (iii) Injury to a nerve. Should the mishap take place, the measures to adopt are those for wounds of nerves given in the Fourth Book. Take care not to let any infrigidant agent touch the wound (like nightshade and sandalum), but rub warm oil all round. The large basilic vein has arteries, nerves and muscle beneath it. There are sometimes two arteries with it, and in thinking one avoids the one, one hits the other. The nerve may also be mistaken for the vein. Hence in this case it is best to go as low down the arm as possible, as then the artery is out of the danger-zone. (iv) Injury to an artery. The sign that one has entered the artery by mistake is that thin red blood comes out and cannot be staunched. Pressure will stop it. One must quickly put rabbit-hair into the wound, with a little powdered frankincense and dragon's blood, and aloes and myrrh, and a little zinc sulphate. Apply a cold compress and bandage tightly. If this arrests the bleeding, keep it so for three days, and even then be very cautious about loosening the bandage. Apply a styptic plaster instead. When the artery is hit deep down, the flesh may close over it and stop the bleeding. But usually death from hæmorrhage will result. Some have died of the great pain produced by a ligature sufficiently tight to arrest the bleeding, or from the mortification of the limb produced by the tight bandage.—Note that the veins may bleed alarmingly freely.

(v) Inability to find the vein. Do not keep on making attempts to puncture the vein, especially if the hand is being used ; repeat a trial at some other level, or use some other vein, or wait a day or two. Remember that a tight bandage may have the effect of emptying the vein instead of swelling it. In the case of fat persons, however, the veins are so slack that it requires a tight bandage to make them show.

(vi) Poor flow of blood. If fat gets into the orifice, do not cut into it, but push it gently aside.

Other points.—Some maintain that the operation is less painful if the parts are made numb with a tight bandage for about an hour previously.

(*f*) *Amount of blood to be removed.*—There is a proper time for arresting the flow in various cases. Some persons, even though febrile, can bear losing five or six pounds of blood, whereas others cannot stand losing even one pound, though apparently in health.

One must consider three points. (*a*) An impetuous exit of blood or a sluggish flow. (*b*) The colour of the blood. It is permissible to go on drawing blood as long as it is black and thick. But if it turns pale and is thin, its flow must be quickly arrested, lest dangerous results ensue. It may be pale and watery at first, so that one might think one should stop the operation, even though one knows there are signs of plethora. For the colour of the blood does not always correspond to what would be expected in cases of plethora. The colour of the blood is also misleading when there is an inflammatory mass from which the blood is coming. (*c*) The state of the pulse. If the flow of blood fails, and the colour alters, and the pulse becomes weak, stop the bleeding. Also, if yawning and stretching, hiccough, or nausea come on. Watch the pulse if the colour changes quickly and the flow is free, so as to be on guard against syncope. (See below).

A limited venesection is a great conserver of the strength and yet it entails the flow of tenuous and sometimes clear blood, with retention of the thick and opaque blood. Liberal venesection is very liable to cause syncope, but is more cleansing ; it clots more slowly, but is more efficient in those cases in which it is done prophylactically, and in obese persons. It is better to do a liberal venesection in winter, as the blood does not clot ; it is better to do a limited one in summer, if it is needed then at all.

When the blood-letting is done to stop hæmorrhage by drawing blood away from the site of bleeding (e.g., epistaxis, uterine hæmorrhage, hæmoptysis) draw only a small amount, and employ several sittings rather than one single one, unless the case is very desperate. (Repeated small bleedings would certainly tend to produce an auto-hæmostatic effect, as we now know).

(g) *Syncope.*—Syncope rarely occurs during the flow of blood, unless a great amount is lost. One only bleeds up to syncope in cases of synochal fevers, in incipient apoplexy, in extensive angina or inflammatory swellings, or in cases of severe pain. Even in such cases one would make sure the strength of the patient is adequate.

The persons liable to faint as a result of blood-letting are those of hot temperament, and with lean and flabby bodies. Those with equable temperament, and with firm flesh, are not likely to faint unless a large amount of blood is withdrawn. Watch the pulse.

The first blood-letting may be accompanied by syncope if it is carried out quickly on a person not accustomed to it ; therefore emesis should first be procured to guard against that, and it may be repeated at the time of the blood-letting.

(*h*) *After-treatment.*—(i.) Washing the part.—When washing the part the skin must be deflected by means of one's finger, so that the site of puncture is no longer over the aperture in the vein. Then wash ; dry carefully ; apply a compress. Then allow the skin to return to its natural position. (ii.) Diet. The loss of blood is replaced by grilled meat, with its gravy, or by giving forced-meat balls. Allow only small quantities, for the stomach will not be able to digest much. Light food should be given first, and the full dietary only resumed gradually. (iii.) Other points. The patient should lie supine. A resolvent bath must not be taken. Exercise must be avoided. (iv.) Suppuration of the wound. The wound may become inflamed. Apply a plaster of ceruse, and dress with cold, wet infrigidants. The other arm would have to be used if venesection has to be repeated subsequently.

1028. *Repetition of venesection.*—(i) Indications: the operation may be repeated often if the humours are much in excess, for the operation sets them in motion (" causes them to boil "). But if the blood be rich in atrabilious humour, the blood-letting should be infrequent. Though soothing at the time, it results in undesirable disorders, including apoplexy, especially in old persons. (ii) Proper time-interval before repeating the blood-letting. This depends on the degree of weakness. If there be no weakness, it may be repeated within an hour, in which case the blood is prevented from clotting by applying bread soaked in oil with a little salt over the wound, and keeping it in place with a bandage. If much blood has to be taken, wait a day. Two or three days is the limit for re-opening the wound. (iii) Technical details regarding the re-opening. Another vein may have to be used, especially if the hand was used previously. The same place must not be used if a palsy was accidentally produced previously. Some force may be needed to get into the vein next time. [A special hammer appears to have been used, instead of using steady pressure. (Albucasis.)] If the second blood-letting was to be done within an hour, or during the same day, the first incision should have been transverse; but if a day or more elapse, a longitudinal cut is best. The movements of the fingers will keep such an opening patent. The scalpel should be narrow. (iv) Treatment between the operations.—Sleep hastens clotting, and prevents the superfluities from getting into the blood, because they pass into the interior parts of the body during sleep. Sleeping on the side from which the blood-letting was done tends to damage the tissues.—The strength of the patient must be maintained proportionately to the amount of blood evacuated.—The bowels must be kept clear.

1029.—*Precautions regarding blood-letting in fevers.* (i) Indications. When the fever is septic, and the inflammation is not great, the ten rules already given are to be followed. Note the urine. If the urine turns thick and reddish, and if the pulse is large, and the face swells, and the fever does not quickly improve, blood-letting may be done, and it should be on a fasting stomach. But if the urine becomes thin and " fiery," and if the face wastes from the outset of the illness, avoid blood-letting.—Blood-letting may be done during an apyrexial period.—When the fever does not arise from putrefaction, bleeding without depleting the treasury of blood will resolve it. But bleeding *may* kindle up a fever. (ii) When to operate.—If the indications are present, take no notice of those who assert it should not be done after the fourth day of the illness. It may be done any day, even after forty days, avoiding only the moment of a fever paroxysm. Otherwise follow the ten rules already referred to. (iii) Quantity to remove. Do not remove much blood at first in hæmorrhagic fevers, and take plenty at the stage of maturation, for this itself will often put a stop to the fever.—Stop the flow if you find the blood is pale and watery. Phlebotomy often disperses fevers, and resolves putrefaction.—When the febrile person is enfeebled, one should divide up the venesection.—Note that as venesection draws contrarily, it has a constipating effect.

21.—THE OPERATION OF CUPPING

1030. The operation of cupping cleanses the particular part of the skin more effectively than does venesection. It withdraws the rarefied rather than the more viscid blood. It is not much use for persons with bulky coarse bodies, with thick blood, for it does not withdraw any blood from them, even that component which it is desirable to withdraw. It only removes such (matters) as are extremely tenuous—and even these only with difficulty. It also produces weakness in the member to which the glasses have been applied.

1031. *The proper time for using cupping-glasses.*—Some authorities advise against applying cupping-glasses at the beginning of the lunar month, because the humours are then not yet on the move or in a state of agitation ; also against applying them at the end of the (lunar) month, because at that period (of the cycle) the humours are less plentiful. The proper time (according to them) is the middle of the month (when the humours are in a state of agitation) and during time when the moonlight is increasing (when the humours are on the increase also). During that period the brain is increasing in size within the skull, and the river-water is rising in tidal rivers.

The time of day proper for using cupping-glasses.—The second and third hours are best. One must take care not to apply cupping-glasses after the bath, except in the case of the blood being thick. If so, the bath is taken first ; then wait an hour ; then apply the cupping-glasses.

1032. *Points of application.*—(*a*) Forehead : most people have a horror of applying cupping-glasses here, as they believe that the senses and intellect[1] will suffer thereby.

Point of Application.	Equivalent in regard to venesection.	Uses.
(*b*) Nape of neck[2]	From median vein.	Heaviness of eyelids (relieves the lids), itch of eyes, fetor of the mouth.
(*c*) Between the shoulder-blades[3]	From basilic vein.	Pains in upper arms and throat ; to relax the cardiac orifice of the stomach.
(*d*) Over the two posterior neck veins[4]	From cephalic vein.	Tremor of head ; and for the components of the head (face, teeth, molars, ears, eyes, throat, nose).
(*e*) The legs	Almost equivalent to blood-letting.	Cleanses the blood ; provokes menstrual flow[5].
(*f*) Under the chin.		Teeth, countenance, throat ; cleanses head and jaws.
(*g*) Over the loins.		Inflammatory masses in upper part of thigh,—scabies there ; pustules ; podagra; piles; elephantiasis; bladder ; uterus ; pruritus of back [renal congestion].
(*h*) In front of thigh.		Orchitis ; leg ulcers.
(*i*) Behind hips.		Inflamm. conditions and ulcers of buttocks.
(*j*) In popliteal space.		Aneurysm ; long-standing abscesses ; septic ulcer of leg and foot.
(*k*) Over malleoli.		Retained menses ; sciatica ; podagra.
(*l*) Over loose tissues of outer side of hip.		Sciatica, podagra ; piles ; inguinal hernia ; the structures within the hip joints.
(*m*) Over the buttocks, towards the anus.		Draws humours from whole body, from head ; benefits the intestines ; cures decomposition of menses, and thereby alleviates the whole body.

Notes.

1. Muhamad says that if placed over the hollow of the occiput they induce loss of memory (Mgn.).

2. There is a danger of transmitting forgetfulness, for as some say, the posterior part of the brain has to do with the preservation of memory, and the cupping enfeebles this faculty, and the offspring will suffer. Some say that cupping over the occiput and top of the head is beneficial for insanity, vertigo, and for preventing the hair from going grey. But we must take it that this effect on the hair applies only to feeble-minded people and not to other types of person, for in most cases the use of cupping in this situation brings premature greyness, and also dulls the intellect. But it is beneficial for eye-diseases, and indeed this is its chief value, namely for pustular keratitis and staphyloma. But cupping in this situation is harmful for cataract, unless the proper moment is chosen. It impairs the activity of the intellect, making the offspring dull and forgetful, with poor reasoning powers, and permanent infirmity.

3. Glasses applied over the scapulae as well as between them are beneficial for hæmorrhagic diseases of the chest, and sanguineous asthma, but are enfeebling for the stomach and set up palpitation.

4. To prevent tremor of the head occurring, we move the glasses downwards and then upwards again to over the scapula, unless the cupping is being done for hæmoptysis, in which case one must move them down but not upwards again.

5. In the case of pale flabby women with watery blood, cupping of the legs is more advantageous than a venesection from the saphenous vein.

Note that the use of movable cupping-glasses over an area, and their use for joint diseases is still practised under the name of Bier's treatment.

When the cupping is done with heat, whether with or without scarification, it is more efficient. But cupping with scarification is more efficient, especially in cases of flatulence (of various kinds). Cupping without scarification is more applicable for cold swellings, and whenever the cups are to be moved about over various places.

§ 260. The distinction between wet and dry cupping is not very evident. In the mediæval drawings referred to below, the use of scarifiers with the cupping seems usual. It will be clear that the action of the two measures is quite different, dry cupping leading to the formation of autohaemolysins, the wet cupping being more of the nature of a " mild evacuation," a less drastic procedure than bleeding from a vein—perhaps largely because the victim did not see the blood, and because the quantity of blood withdrawn was necessarily limited in amount.

1033. *Some of the purposes in view in cupping.*—(i) to move materials away from one part to another. Thus menstrual flow will be arrested if the cupping is done over the breasts.

(ii) To draw an inflammatory process from deep parts towards the surface and so render it accessible to some medicament.

(iii) To divert an inflammatory process to a neighbouring and less important organ.

(iv) To render a member warm, and draw blood into it, and disperse vapours from it.

(v) To restore a member to its proper position (e.g., inguinal hernia).

(vi) To allay pain. Applied over the umbilicus they relieve violent colic and flatulent distension of the abdomen, and the uterine pain due to movement of the menstrual fluid, especially in young women [e.g., dysmenorrhœa].

1034. There are three points to note in regard to wet cupping—(*a*) the evacuation from the member itself; (*b*) the safeguarding of the basis of the life-breath, so that the latter shall not leave the body with the humour which is being evacuated; (*c*) the evacuation must not be made from a vital organ.

In wet cupping, the scarification must be deep to ensure drawing the humours from the deep parts.

Such cupping must not be done over the breasts themselves, for fear menstrual flow and epistaxis should be set up.

If the region to be cupped is covered with ointment one should not delay the scarification. The first point of application should be made light and the cup removed quickly. As the part is accustomed to the cups, they may be left longer.

The site of the cup may afterwards develop inflammation, and thus render it difficult of removal. To avoid this a cloth or sponge soaked in tepid or nearly hot water should be used as a fomentation round it.

Cupping of the upper parts of the body ensures that morbid materials will not pass down into the lower parts of the body.

1035. Age.—One should not begin to apply cupping to infants until they are in their third year; cupping should be quite unnecessary in the first year of life. It is altogether contra-indicated after the sixtieth year.

1036. *After-treatment in regard to food.*—In ordinary persons, a meal may be taken an hour after the cupping has been completed.

Persons of bilious type should be given the following foods after being cupped: pomegranate juice with the seeds; endive juice with sugar; lettuce and vinegar.

§ 261. During the Middle Ages, in Europe, cupping was practised as part of the ritual of the bath-house. The subject is very fully dealt with by Alfred Martin (Jena, 1906), who presents numerous illustrations from contemporary literature. Though the practice has disappeared from our customs, it has done so only comparatively recently, and may be still practised among other peoples. The necessity for several attendants during the course of the ritual determines its restriction to public institutions, only the very wealthy having their own suite for their own families. Both sexes were employed in the service, which included most of the operations now confined to the barber; women were chiefly employed for fetching and carrying, men for seeing to the heating apparatus. But the service of cupping and venesection was confined to men, generally the "bath-men," who specialized in the work.

The rules found in the Canon appear to have been conformed to. Thus, the association of cupping with bathing is found in the pictures representing the bather in the hot room or calefactorium, sitting on a special bench, with his feet in a hot bath reaching to the knees, "to make the blood watery," whilst the bath-man is engaged in applying the cupping glasses (or horns).

The practice of cupping in the ordinary routine of life was an expression of the universal desire for ensuring prophylaxis against disease. Concurrently it was applied for the treatment of declared disease, and this use survived the other. Even in these days it is occasionally employed with advantage, and the method is deserving of much more attention both by students and practitioners.

§ 262. It is easy to see how and why the subject has fallen into discredit and then disuse, when we combine the study of habits and customs with one of the generally changed outlook produced by modern education. The conclusion, however, that the subject-matter of this section of the Canon was inherently erroneous or superfluous must be avoided. Thoughts run along parallel lines with practice, habits, public opinion. To us, who live to see all these lines at once, it appears as if one were integrally related to the other. But even now we may not realize that we are only viewing one small field of a whole panorama. It is necessary to look forwards also, for then it becomes clear that theories, ideas, modes of practice, all really run along their own lines, each justifiable in itself; the people of one age seeking to hold all the lines together and by force making them into a unity which they cannot possess. So it may be said that the instruction of the Canon in regard to these various modes of treatment was sound, and remains sound, but the days of their usage have gone.

22.—About Leeches

1037. The Indians have specified which leeches are venomous. One should beware of using those with large heads of antimonial and black colour, or green colour; those with down on them, like eels (snakefish), and those upon which are fine streaks of bright colour, or chameleon-like in colour. All these are poisonous, and would give rise to inflammations, hæmorrhage, fever, syncope, paresis of the limbs, and intractable ulcers.

One should not employ leeches taken from unhealthy water or those whose excrement is black and muddy, and whose movement immediately darkens water, and renders it offensive in smell. Take leeches from water whose surface is covered over with duckweed and in which frogs live. Pay no attention to those who make out that leeches are bad to use if they come from water in which frogs live.

The colour should be greenish (like duckweed), and there should be two longitudinal lines having the colour of orpiment and ruddy; they should be rounded and liver-coloured. One may accept leeches which look like little locusts, or like mouse-tails, with very small heads. But do not accept those with red bellies and green backs, especially if they were collected from running waters.

(Aeg. gives: there are six rust-coloured lines on the back, varying from blackish to greyish green; the under parts are either yellowish-green with black spots and edging, or brownish-orange without spots, but two lateral black stripes).

A leech is ill if the mouth is soft, if it is covered with dirty slime, if there is a skin near it as it swims about in the water, and if it lies coiled up in tepid or in fresh water. (Aeg.)

1038. The blood which leeches remove from the body comes from deeper down than that obtained by wet cupping.

1039. *Procedure of application.*—Leeches should be kept a day before applying them, and they should be squeezed [or have their heads bent down. Aeg.] to make them eject the contents of their stomachs. If feasible, they should be given a little lamb's blood by way of nourishment. The slime and débris from their bodies should be cleansed off, say, with a sponge.

1040. *Site of application.*—The place where the leeches are to be applied must be [shaved if necessary: Aeg., and] well laved with nitre-water and rubbed till red. Dry carefully. Dip the leeches in fresh tepid water [a few drops of white wine being added if they are sluggish. Aeg.], cleanse and apply [with one's freshly-washed hand, or with a soft towel, or in a test-tube called a "leech-glass"—especially if the place in question is the palate or gums]. The point of application may be smeared with clay (or moistened with sugar-water or milk) or scratched with a needle till blood appears, in order to coax them to take hold.

§ 263. The leech must not be let go until it has taken proper hold, as one can tell by the sinuous movements of the neck and from the circumstance that the head forms a right angle to the body.

To ensure that they will not crawl into the gullet, or nose, or anus, one must draw a thread through the tail end from above down—not from side to side, otherwise one would injure the large blood vessels of the animal.

Place chosen for the application.—One must not apply leeches to unhealthy skin, or to places where there are subjacent large vessels, or where the skin is very thick (palm of hand; heel), or in a situation where healing would subsequently be interfered with because of pus or septic matter flowing over it from near by.

1041. *Removal.*—When the leeches are full, and you wish to let them come off*, sprinkle a little salt over them, or [pepper, or snuff], or ashes or nitre, or burnt bristles, or flax, or burnt sponge or burnt wool. They will then fall off.

Do not detach leeches forcibly, or else there may be violent hæmorrhage.

1042. *After-treatment.*—After the leeches have fallen off, the place should be sucked by cupping it, in order to extract some of the blood at the spot and thereby get rid of the toxic substances left in the wound. [If one wishes to keep the blood flowing anyway, one applies warm, dry cloths to the part, or a warm poultice, or a sponge soaked in warm water. After the bleeding has stopped, apply a soft, dry compress].

If the blood will not stop flowing, dust the spot with finely powdered burnt galls, quicklime, ashes, ground-up earthenware and similar styptics.

§ 264. [Alum, cobwebs, pitch, gunpowder, hydrates, sesquioxide of iron, or pressing the skin into the folds have been advocated. The cautery has been necessary as a last resource. All such remedies should be at hand.

Do not leave the patient till the bleeding has quite stopped, and if it is a child, watch it the following night as well.

If a leech should have got loose and been swallowed, give salt-water to drink, copiously. If a leech has wandered into the anus, give a salt-water enema.

Do not use leeches again if they have been applied to a case of typhoid fever, cholera, smallpox, or syphilis.]

1043. The use of leeches is beneficial in subcutaneous maladies like serpiginous ulcers, morphew, impetiginous ulcers, and the like.

Annotation by Costaeus: Leeches are very effective also for pleurisy and for opening the hæmorrhoidal veins.

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* One may wish to detach them before they are full, because the patient is fainting or develops cramps.

23.—THE RETENTION OF SUBSTANCES DUE TO BE DISCHARGED.

1044. Substances which are due to be discharged may be retained within the body for the following reasons: (1) the material may be withdrawn from the part, but not from the body itself; (ii) the material may be retained, although an evacuation or discharge is actually taking place at the same time. (iii) The retention of these substances itself aids evacuation. The substances here meant are infrigidants, styptics, glutinous medicines, caustics. (iv.) stricture.

(i) Materials are retained because attracted to a certain place, and no (outward) evacuation occurs. Ex. the application of cupping to the breasts,—this relieves uterine hæmorrhage. The action is more decided if the pain in the (diseased) part is first relieved.

(ii) The retention of substances although an evacuation is taking place. For instance, venesection from the basilic vein may serve to arrest emesis in a case of purgation; or purgation in a case of emesis. Or again, cessation of both discharges if the sweat is (strongly) provoked at the same time.

(iii) The retention of material helps evacuation in the case where one cleanses the stomach and intestines from glutinous unhealthy humours by giving lubricant laxatives, using picra; or where one procures a thorough cleansing of the cardiac orifice of the stomach by emesis, for cutting up of the material which remains behind in the stomach.

Styptic medicines aggregate abnormal matter, and contract up the lumen of the passages.

Infrigidant medicines clot the material, and cause the orifices to tighten up and become narrow.

Glutinous medicines choke up the orifices of the channels (of the body), and if they are desiccant as well, and sharp (or hot), this action will be still more decided.

Caustics produce an eschar or scab, which stays on the orifices of the passages, and becomes hard and closes them. But the obstruction may be harmful. The scab may get loose or break, and the underlying aperture would thereby become enlarged. Some caustics have a styptic action (e.g., copper sulphate) and some have not such an action (quicklime). The styptic caustics are required when one wants a firm scab; the others are used when one wishes the scab to come off before long.

(iv.) Retention of material by stricture.—There are two varieties. In one the foramen is closed and contracted, so that the adjacent parts are fused together. This happens for instance when the artery is opened in mistake for the basilic vein in doing venesection. The other is where the outlet of a wound is blocked, and the channel itself is blocked, as when we insert rabbit hairs into a wound.

We may say, in brief, that if blood is flowing out because the orifices of the veins are open, we must use styptics to tighten them up ; but if it is flowing because of rupture of the vessel, glutinous styptics must be used, like Lemnian earth ; and if it is due to ulceration (erosion), one must incite the development of granulations by adding something which will cleanse away the corrosive substance.

24.—THE TREATMENT OF OBSTRUCTIONS.

1045. Obstructions are due to the humours being thick, or viscid, or over-abundant.

If the humours are simply over-abundant, their injurious effect is removed by evacuating them either by venesection or by purgation. If the humours are thick, they must be rendered thin. If they are viscid, and tenuous, incisives are required.

You have now learnt the difference between a thick or coarse and a glutinous quality ; it is the difference between melted glue and clay. Thick or coarse humour requires attenuation by a resolvent to make its expulsion easy ; viscid or glutinous humour requires an incisive which is able (*a*) to cut its way between the fluid and that to which it adheres [the wall of the passage], thus parting one from the other, and (*b*) to break the fluid into small fragments,—because glutinous matter obstructs both by adhesion to its surroundings and by the cohesion of its particles.

1046. In resolving thick humour there are two opposite conditions to guard against. On the one hand, if the resolution is not sufficient it will render the material watery and at the same time increase its volume so much that it cannot be resolved at all, thereby making the obstruction greater still. On the other hand, the resolution may be carried too far, in which case the attenuated portion will dissipate altogether, leaving the sediment behind as a calcareous mass.

Therefore, when vigorous resolution is necessary, one helps the action by the use of lenificant tenuous matter free of coarse particles, and moderately " hot," for this will assist in removing the whole of its obstructive action.

Obstructions in the veins are worse than others. Obstructions in the arteries are still worse. Obstructions in the vital organs are the worst of all.

Therefore it is better to combine astringency and attenuation in an aperient, because the former will counteract the damage which attenuant substance does to the member.

25—.The Treatment of Inflammatory Swellings.

1047. As has been explained, some inflammatory swellings are " hot," some are cold and soft, and some are cold and hard. Their causes are either immediate or remote. Plethora is a remote cause ; blows, falls and bites are immediate causes. Some of these causes may befall a body which is in a state of plethora, or one in which the humours are in balanced proportion.

1048. *Inflammatory swellings due to remote causes* or to immediate causes associated with plethora occur either in organs which are adjuncts to vital organs (namely, emunctory organs) or not. If they are not present in such organs, one must not at first apply any of the resolvent agents, but simply relieve the (special) emunctory organ concerned, if there is one. If the particular vital organ has not its own emunctory the whole body requires attention with a view to influencing the affected part by recoil [i.e., using a " repercussive "], drawing the material to a different organ, and also introducing an astringent influence. Owing to a difference in the member, an attraction may occur for something placed in the opposite side, whether by using some appropriate exercise, or by applying something heavy over the part. Thus, inflammatory matter may often be drawn away from the hand by keeping something heavy over the place for an hour.

1049. For acute inflammatory swellings, astringent repercussives must be purely cold in temperament. But if the swelling is " cold," the remedies must be combined with something possessing a heating property in addition to being astringent, such as bogrush, and aẓfāruṭ-ṭīb [a medicament derived, according to some, from a certain species of oyster, Indian Ocean].

During the stage of maturation of the inflammation, the retentive quality of the treatment must be kept down, and it must be combined with something resolvent. When the height has been reached, the two classes of remedy may be given in equal proportions. Then, during the stage of declination, the remedy should be simply resolvent and relaxing. Cold relaxing remedies have a more desiccant effect than hot ones.

1050. *Inflammatory swellings produced by immediate causes* in a person who is not plethoric require an initial treatment with relaxant and resolvent remedies, otherwise the treatment is as before.

The inflamed organ may be the emunctory of a vital organ, as is the case if the glands of the neck are inflamed, for these are related to the brain ; or the glands of the axilla, which are related to the heart; the glands of the groin, which are related to the liver. In all such cases one must certainly not employ repercussives—not because it is a wrong treatment for inflammation in these situations, for it is not wrong—but because in this case we do not wish to touch the inflammation itself. Our aim is to direct our energies to enlarging the swelling and convey morbid material to it from the vital organ itself. We can do no good as long as there is disease in the vital organ, and our efforts must be directed towards relieving *that*. Were we to employ repercussives, we should risk returning the morbid material back to the vital organ, and finally make its state so bad that we cannot possibly mend it. That is why we aim at drawing the unhealthy material down to an ignoble member, so relieving the vital organ of which it is emunctory, and we encourage the inflammatory process in the ignoble member, even to the extreme of applying cupping or calefacient plasters which will draw the inflammation thither.

When the inflammatory mass has in this way become fluid, it may burst of its own accord, especially if it be in an emunctory organ ; the promotion of maturation will help to bring about this result. Sometimes both maturation and incision must be done together. Maturation is favoured by the use of an agent which both obstructs and agglutinates, for in this way the heat of the part is maintained. In carrying out such measures one should watch to see when the innate heat is feeble or the tissues are breaking down. At that moment the agglutinative and oppilative remedy must be removed and an aperitive medicine given, making a deep incision. After that, resolvent and desiccative medicines are to be applied which we shall specify in the Special Part.

When the inflammation is deep-seated it must be drawn towards the skin, even if to do so we must employ dry cupping.

1051. *Hard inflammatory masses.* When these are at the end of the first stage, the treatment is to soften with remedies which are " hot " and not very " dry," because one must not make it so dense as to undergo calcification. The aim is to dispose the mass to resolution, increasing the resolvents up to a point, and if one is then afraid that the dispersal of the resolved portion will lead to calcification in the residue, the softening process is resumed. These alternations are repeated time and again until the whole is dispersed by the alternate softening and solution.

1052. *Gaseous swellings* are treated by agents which have a calefacient effect and rarefy the (gaseous) substance, and open up the pores. This treatment depends on the view that the swellings are due to coarseness of the gaseous particles and to closure of the pores. In addition one must take measures to prevent the appearance of the material from which the gaseous matter arises.

1053. *Inflammatory swellings with ulceration.*—E.g., vesicular or herpetic ulcers. These require infrigidants. If they are like phlegmon, they do not need emollient treatment [Margin: humectant treatment, unless they are to be opened] but desiccant treatment, because the secondary state—the ulceration of the inflammatory mass—which one feared has actually happened, and the proper treatment of ulceration is by desiccants, not emollients [Mgn : humectants].

1054. *Internal inflammatory masses.* The morbid material in such swellings must be removed by venesection and purgation. The following must be forbidden: use of baths; wine; bodily exercise (or movement), avoidable mental emotions, like anger and the like. In the early stages repercussives must be given and minimum bulk of food (lit. : not too much, " superfluity "), especially if the organ affected be the stomach or liver. As the time of resolution arrives, one must not omit introducing astringents of agreeable odour, in the manner in which we have set forth for you in preceding pages. This principle is more important for the liver and stomach than for the lung.

Emollient medicines, or mild aperients, are to be given to those cases in which maturation is taking place, for they are beneficial to inflammatory processes. Ex. : nightshade, cassia fistula. Nightshade has the power to disperse acute inflammations in the internal organs. One should give only light food, and not even then either at the beginning of an attack or during it, unless the patient is very feeble. The signs of a collection of [pus] in the internal organs, associated with loss of strength, indicate that the patient is on the road to death unless nutriment is given to sustain his vitality. But the giving of food is very risky. Therefore it will be well if the disease should resolve of itself, and if the (abscess) bursts [i.e., into the alimentary tract], such things as honey-water and sugar-water may be given to lave the parts, following them with remedies which favour maturation and are desiccant. Finally, one administers desiccants alone.

This subject is fully dealt with in the Special Part under the appropriate headings.

1055. Internal inflammatory swellings in the abdomen may give rise to errors in diagnosis. If the condition is not inflammation but rupture, there is a danger of perforation. Such swellings are not usually in the omentum, but in the intestine itself [e.g., appendix], and it is dangerous to give aperients.

26. ON MAKING INCISIONS

1056. When one decides to make an incision or opening (into the diseased part) one should take into consideration the various small and larger folds of the skin. In the case of the forehead however one would act otherwise, because an incision along the folds there would divide the muscles and cause drooping of the eyelids. Similar care must be taken in the cases where the muscular fibres take a different course to the surface folds. The surgeon must therefore know the anatomy of the nerves, the veins, and the arteries, so as not to sever them by mistake. He also needs various drugs for staunching the blood, plasters to allay the pain, and the appropriate instruments handy—namely Galen's remedy; rabbit-hair; spider's web; white of egg; the cautery. With such agents one is able to arrest the flow of blood if due to an accidental injury (by the surgeon), or whether it be inevitable, or the result of emollient medicines which provoke hæmorrhage.

Having opened the abscess and extracted its contents, one should avoid applying oil, or water, or a plaster containing oil, or " basilicon." One should use a plaster made with vitriol, if something has to be applied. A sponge soaked in astringent wine may be applied to the part.

27.—GANGRENE. EXCISION

1057. When decomposition occurs in a member, whether involving humoral matter or not, owing to some depravity of the temperament, and when wet-cupping or the usually effective epithemes particularized in the special books fail to benefit, then one must remove the corrupt flesh. If this can be done without the use of the cautery-iron, so much the better, because that is injurious to the nerves supplying the muscles and is dangerous to the arteries.

If this is unavailing, and the decomposition is spreading still more deeply into the flesh, excision becomes necessary and one must burn the place with boiling oil to antagonize the virulence of the disease and prevent hæmorrhage. The flesh will fill up again but the skin will shrink and resemble flesh in its hardness.

1058. When you are about to excise the gangrenous part, cut along the bones where the flesh is adherent, and still healthy, and the pain is greatest, this being the indication of the healthy margin. Any part that is boggy and flabby belongs to the gangrenous part and must be excised with it.

1059. Should the part you propose excising entirely surround the bone, involving the foramina where gangrene is taking place, excision and the use of a saw is required. If you decide to do this, go in between the place for excision and the site of perforation and flesh, to avoid causing pain. If bone is projecting into the part to be excised, and is irreducible, and there is a risk of the tissues next to it undergoing gangrene as well, we should raise up and tear off the flesh from it, stretching it by bandages to an adjoining part or using any device for the purpose which seems best for the occasion. The object is to separate the diseased part [and its fasciae] from the healthy tissue as far as possible, after which it can be wholly excised.

1060. If the part affected is large, and with nerves, arteries and veins in the vicinity (for instance, the thighbone), and if the gangrenous change is very great, the doctor should leave the case severely alone.

28. The Treatment of Loss of Continuity (including Ulcers, Blows, Bruises, Dislocations)

1061. *Fracture.* Loss of continuity in large members [e.g., fracture of a long bone] is treated by securing apposition and applying bandages in a suitable manner, as described in the Special Instructions given in the appropriate Section. The part must be kept at rest. The diet should include conglutinant foods which will supply chondrogenous nutriment to the seat of injury, and bring about the closure of the edges of the fracture and make the bone continuous again. Food of this kind can be prepared from the feet of animals. When a person has reached the prime of life there is no other way of procuring reunion of the bone. But further details on restoring continuity are given in the Special Part.

1062. *Wounds.*—There are three principles to follow when treating loss of continuity in fleshy tissues. (1) Stabilize the part which is insufficiently firm, arrest the bleeding, and if there be a discharge strive to reduce its amount ; (2) make the immobilized part consolidated by administering appropriate medicines and suitable articles of food ; (3) prevent sepsis [lit., putrefaction] as much as possible.

If all three cannot be achieved, concentrate on the two which can. You know from what has already been said how the arrest of bleeding is achieved. Consolidation of the part is secured by apposing the edges of the wound, and by applying desiccant remedies [which tend to reduce the amount of discharge], and by taking agglutinative foods.

1063. *Ulcers.*—In treating ulcers, the aim is to procure dessication, so that the exposed surface shall dry up. Septic changes are treated with caustic medicaments such as yellow or green vitriol (an impure copper sulphate), unslaked lime, arsenic. If these do not succeed, the cautery may be needed, and an application prepared with verdigris, wax, and oil ; the verdigris is cleansing ; the oil and wax counteract the undue causticity ; and so we have a medicine suitably modified or attempered.

All ulcers are either simple or compound. They are simple when they are of small size and there is so little loss of substance that the margins can be reunited, the union being secured by seeing that no oil [or sand or dirt.—Aeg.] or dust gets in between the margins during the process of healing. The fact that the opposite sides will meet ensures that there will be no loss of substance. When the ulcer is so large that the two sides cannot be brought together, and there remains a mark, or depression, or a gap, which is full of sanious matter, there being already an actual loss of substance, the treatment must be desiccant.

If there is loss of substance, then, healing will necessarily be by cicatrization. This is induced in the first place by means of astringents, and in the second by applying acrid [or escharotic] substances, for instance—yellow and green vitriol [cf. " red lotion "], because these assist desiccation and the formation of a scab without producing further corrosion, and consequent enlargement of the area of the ulcer.

1064. If the loss of substance be of flesh, as happens with deep wounds, we cannot hurry the cicatrization. The first thing to do is to encourage the formation of fleshy granulations, and this will not occur unless the " dryness " be hardly more than of the first degree. One keeps a look-out for any conditions which will expedite recovery. Thus (i) the state of the temperament of the organ concerned as compared with that of the ulcer itself.—For if the organ in question is very " moist " in temperament and the ulcer not very " moist," a small amount of desiccation—namely, to the first degree—will be sufficient, for the malady is very nearly the same in character as the member affected. But if the member (in which the ulcer is situated) is dry in temperament, and the ulcer very moist, desiccation to the second, and even the third degree will be needed before the temperament of the lesion can be restored to the normal. Cases which are between the two extremes will need equalization of the respective states.

One must also consider (ii) the temperament of the body as a whole.—If the body is of very dry temperament, and the diseased member is more humid than normal, we aim to reduce the humidity to one more nearly approaching equipoise. One applies desiccant remedies. The converse applies if the temperament of the body were more humid and the affected limb were drier. If both the body as a whole, and the affected part are increased in the same direction, more decidedly dessicant treatment is indicated if the excess be on the side of humidity, and less desiccant treatment if the excess be in the direction of dryness.

One must also consider (iii) the potency of the desiccants. All desiccants promote the formation of granulation tissue (lit. flesh), but a powerfully desiccant action is not required. All that is needed is to hold back any material which is of a character likely to contribute to the formation of granulations in its passage down into the affected part. Therefore one searches for a desiccant agent which is useful for promoting cicatrization rather than the formation of " flesh," but one also prefers one which is abstergent and cleanses away the sanious matter to one which promotes desiccation. The ideal desiccant promotes cicatrization, consolidation of the part and restoration of continuity. All remedies which are desiccant without any caustic (by-) action can be included among those which promote the formation of granulations.

1065. Ulcers in situations which are not fleshy, and round ulcers, cannot be made to heal quickly.

Internal ulcers require the admixture of purifying agents like honey, or special remedies for the affected part (e.g., diuretics for ulcers in the urinary passages) with the desiccant and styptic preparations needed in any case.

To promote cicatrization one may use a remedy which is viscous as well as astringent or styptic, like Lemnian earth.

1066. *Conditions which prevent the healing of an ulcer.*—(i) unhealthy temperament of the affected part. One must endeavour to rectify this. (ii) Unhealthy temperament of the blood supplied to the part. This is to be remedied by diet, choosing that which will produce good chyme. (iii) Undue abundance of blood entering the part, rendering it too humid. This is counteracted by purgation, by a diluent diet, and exercise as far as is permissible. (iv) Disease of the underlying bone whereby sanious matter is constantly (flowing over the ulcer). The only remedy for this is to deal with the bone-disease : massage can help to get rid of the diseased bone, otherwise it must be excised; (v) adductive plasters are often required for the treatment of ulcers to enable the fragments of bones and foreign objects lodged in the flesh to be withdrawn, for otherwise they prevent healing; (vi) more nutritive food may be indicated, in order to provide strength to the tissues and yet the nutriment may need to be curtailed in order to lessen the discharge of sanious matter from the ulcer. So there is a certain difficulty in adjusting these contrary objects, for sanious discharge is debilitating, and the remedy for this is to supply more nutritious food; and yet to make the diet more liberal entails increasing the amount of sanious discharge. The doctor has therefore to make his decision according to circumstances. [(vii) Malignant disease. Cautery and excision are indicated.]

1067. *Bathing.*—When an ulcer is forming, the patient must not enter a bath, or use hot water, because this will attract matters to the ulcer which will lead to the formation of an inflammatory swelling. But when the ulcer reaches a stationary stage, and discharges sanious matter it may be permissible.

1068. If an ulcer recurs soon after being healed, it needs consolidation and is on the way to becoming a fistula. One must therefore watch the discharge very carefully, and also the colour of the edges of the ulcer. If the discharge increases apart from an increase in the amount of food, it denotes maturation.

1069. *Dislocations.**—We speak now of the treatment when tissues are torn, as by dislocation. That is, we speak of cases in which there is a loss of continuity deep down under the skin. In such cases, it is evident, the medicinal agents must be more potent than when the lesion is exposed to view.

These deep tissues are rich in blood, and therefore the congestion needs relieving, but this must not be at the risk of undue desiccant action, for in that case the tenuous parts would be dispersed, and the thick residue would become a stone.

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* Note that the terms employed in the original text are indefinite. The use of the words "dislocation," "contusion," "sprains," represents the apparent intention of the text, though the context is not consistent therewith throughout.

When we have procured as much dispersal as is necessary, we apply a consolidative of desiccant character, to enable material to escape, instead of lodging in the cavity and finally giving rise to a stone; in such a case it might either decompose or be removed in some other way, allowing the continuity to be restored.

If the lesion is still deeper, the place is scarified to enable the medicament to get in better.

1070. *Contusions.*—If contusion is associated with loss of continuity, venesection may suffice. But if the dislocation is associated with a severe crush, the latter must be alleviated first, with appropriate medicaments. If the contusion be extensive, desiccants are used. If it be circumscribed, like a stab, it need not be troubled with, unless the wound is a poisoned one, or unless there is great pain, or the nerves are involved, or if there is a risk of suppuration supervening, or if aneurysm develops.

1071. *Sprains.*—A soft bandage is enough, if the condition is not painful. Appropriate medicaments are applied over the dressing.

In cases of falls and blows, venesection is to be done in some part of the body, and the diet must be light ; meat and the like must be avoided. Treat with decoctions and potions.

The subject of loss of continuity of nerves and bones is deferred to a special chapter in the Special Part.

29.—CAUTERISATION (AS A THERAPEUTIC MEASURE).

1072. Cauterisation is a very useful method of treatment, for (*a*) it prevents the spread of a destructive lesion, and (*b*) has an invigorating effect on a member whose cold temperament we wish to rectify ; (*c*) it breaks up putrefactive matters imprisoned in a tissue ; (*d*) it restrains the flow of blood.

A cautery is best made of gold.

The place to be cauterised may be exposed to view, in which case the cautery can be applied without more ado ; or it may be deeply situated—for instance, in the nose, the buccal cavity, the anus. In this last case a special appliance becomes necessary in the form of a hollow cannula, enclosed in some material like Samian earth or the "talc" of the Arabs, or chimolean earth (a red clay) or the "magra" of the Arabs, soaked in vinegar. Around this, one places cloths wetted with extremely cold rose-water or certain juices, and the instrument is introduced so that these coverings make a little pit to receive the cautery, whilst protecting the tissues around from injury, as well as the walls of the meatus down which the cautery will pass. The diameter of the cautery itself should be less than that of the cannula, so that when dexterously introduced, it will reach the exact spot to be treated without touching the sides of the cannula.

The person applying the cautery must take care not to expose nerves, or fasciæ, or ligaments to the brunt of the burning. For arresting hæmorrhage, great heat is required, with vigorous cauterisation, so that a firm thick eschar is produced which will not readily come off. It is this crust forming under the eschar which stops the blood-flow, and therefore if it became loose the condition would be worse than ever.

If the cautery is being applied to remove dead flesh (tissue), pain will show you when you have reached the healthy tissue.

If the cautery is being applied to the bone under the (dead) flesh, one must prolong the time of cauterising the area till the dead matter is all completely destroyed.

If the cautery is to be applied to the skull, the application must be gentle, so as not to risk roasting the brain, or shrivelling up the membranes of the brain. In the case of other bones, there is no need to be so anxious.

30.—The Relief of Pain.

1073. You have already learnt that the causes of pain may be comprehended under two headings : (i) sudden change of temperament ; (ii) loss of continuity. You have also learnt that the first of the headings comprises hot, cold, moist or dry intemperaments ; (iii) and the second occurs apart from deposition of matter, or as the effect of the presence of chymous, gaseous or inflammatory exudate.

The relief of pain, therefore, depends on making use of the contraries of these causes. What the contrary of each is, you have also already learnt, and you have learnt the way in which an intemperament and inflammation, and gaseous deposits are treated.

When the pain is too intense, it may cause death, this resulting in the first place from coldness of the body, and secondly from tremor [of the heart], with a small pulse, which finally fails, thus bringing death.

1074. In brief, pain is relieved either by altering the temperament, or by dispersing the material which produces it, or by producing insensibility. The last named destroys the power of sensation in the part concerned. Insensibility of a part is only produced (*a*) by making it very "cold"; (*b*) by exposing it to the toxic properties which interfere with its functions. Agents which act by producing relaxation, and have a gently soothing effect are such things as dill, linseed, melilot, chamomile, celery seed, bitter almond, and anything which is hot in the first degree, especially if combined with a drug of glutinous character like the gum of prunes, starch, lead carbonate, saffron, gum-resin of cristus, marsh mallow, cardamom, cabbage, turnip, and their decoctions, pharmaceutical adipes, zūfā-i-raṭab, and the oils specified in the Formulary, laxatives, and all forms of evacuant. Laxatives are to be given after other methods of evacuation have been tried, if evacuant treatment is needed, until you have prevented any further material from passing down into the affected part. For it is just that that brings an inflammation to a head, or makes it (burst) open.

1075. The most powerful of the stupefacients is opium. Less powerful are: seeds and root-bark of mandrake; poppy; hemlock; white and black hyoscyamus; deadly nightshade; lettuce-seed; snow and ice-cold water.

1076. One must not overlook an extrinsic cause of pain, by mistake. Thus, external heat, external cold, a faulty posture in bed, falls during epilepsy or during intoxication, etc. Search for intrinsic causes must be otherwise made, by looking for the signs of plethora (which you now know), or for the causes likely to produce plethora.

1077. A source of pain which was at first external may come to be internal, and persist. Thus, drinking of icy water will cause severe pain in the stomach and liver-region. In such a case evacuant treatment and the like may not be particularly indicated, and the use of a bath, and a good sleep after it may be enough. Or, a person may eat something heating, and a severe headache may result from it. For this it is enough to drink cooled water.

1078. *Selection of remedies.*—Sometimes the method used for alleviating pain acts so slowly that there is a risk of its becoming unbearable before the remedy has come into effect. Thus colic may be cured by purging the small intestine of the material giving rise to it, but this requires time. On the other hand one may give relief speedily, but only at the risk of worse harm in the end. Thus, it is possible to apply remedies which will in a case of colic at once make the painful part insensible. The doctor is therefore in a dilemma in such a case, and requires good judgment so as to decide which is more harmful, to preserve the strength or to allow the pain to persist. He has to decide which is worse, the pain, or the danger liable to arise from inducing insensibility of the part. He has to decide which is the more important to avoid, or which is the lesser of the two evils. For, should he allow the pain to continue, there is the risk of it increasing so much as to prove fatal; and if he makes the part insensible, this danger is averted and yet some other part is affected adversely. However, one may be able to remedy that, and then if the pain returns in consequence, one may repeat the process.

In addition to all this one must select the stupefacient remedy according to its own temperament, and the ease with which it exerts its effect. One might administer it in the form of a compound in theriacs (made with it), unless there is particular need to secure a powerful action.

1079. *Internal medication for pain.*—Some members, like the teeth, cannot be treated even by the local application of narcotics, because this is not a final cure. In this case better relief is obtained by internal remedies. So, in painful diseases of the eyes, less harm would result this way than from local application of the remedy.

In the case of other organs, the harm done them by taking a draught is easily rectified. The harmful outcome would be increased, for instance, in a case of colic, because the cold [the narcotic is "cold"] increases the amount of "matter," and solidifies it and encloses it.

1080. Stupefacients often relieve pain because they produce sleep—one of the factors whereby pain is relieved, especially if the patient is fasting, and there is a material cause of the pain.

Stupefacients are safer when they are compounded with other drugs as diluents (e.g., theriac), as for instance "philonium," aromatic electuary or lozenges. But their efficacy is not as great. The fresh lozenges are more efficient than older ones, and very old ones have no action at all. Those which are between the two extremes are intermediate in efficacy.

1081. *The pains of flatulence* are very severe and are yet easy to relieve at certain times. Sometimes it is sufficient simply to pour hot water over the part, though one must take care the pain is not due to an inflammation (which simulates the pain of flatulence) before doing so. It would be a serious mistake, especially at the beginning of (suppurative) inflammation to administer a hot water douche (shower). Sometimes such treatment makes the condition worse, supposing it does not disperse the gases, or cause them to expand.

1082. *Poulticing.*—Another sort of remedy for flatulence is a *poultice*. A poultice may act better if it is combined with a desiccant like millet. Poultices are not applicable to some members; for instance, the eye. In that case cloths are used.

Some poultices are made with hot oil. The most efficient poultices are those made with flour of orobs boiled in vinegar and dried before use. Weaker ones are made with bran, treated in the same way. Steamed salt is burning (scorching); steamed millet is weaker, and better. A safe and easy way of steaming a part is from boiling water in a vessel, but it requires careful control to avoid any of the mishaps we have referred to above.

1083. *Dry* (*hot*) *Cupping* comes under this heading as a powerful means of allaying the pains of flatulence. By repeating them over and over again the pain will be entirely abolished. But this is at the cost of those untoward effects we have already described.

1084. *Other means of allaying pain.*—(1) Walking about gently for a considerable time. The movement softens or relaxes the tissues. (2) Fats of thin consistence, and the oils already named. (3) Agreeable music—especially if it inclines one to sleep.* (4) Being occupied with something very engrossing removes the severity of pain.

31.—The Priority of Choice of Methods of Treatment.

PHARMACE
VTRICA

1085. When several maladies occur together we should deal first with that which fulfils one of the following three conditions :

(1) When the one must be cured before the other can be relieved. For instance, if inflammation and ulceration occur simultaneously, the former must be attended to first until the intemperament on which it depends is remedied. The ulcer will never be healed until that is put right. The ulcer is then treated.

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* Like the mother's lullaby to her child in pain.

(2) When the maladies are related as cause and effect. Example : obstruction and fever. The former must be treated first. If the obstruction will only yield to a "hot" remedy, we shall not be able to cure the fever. We may treat phthisis (inflammation of the lung) with desiccants, but we shall not cure the fever, because its cause is beyond our reach. The cause would be amenable to desiccant treatment, but this would keep up the fever.

(3) When it is absolutely essential to deal with one of the maladies. Thus suppose relapsing fever and palsy should occur concurrently. There is no question about treating the former, and venesection is the proper treatment. But this will not cure the palsy.

The disorder and the symptom to which the malady owes its name may occur together. In such a case one would begin by dealing with the malady itself. But if the symptom became urgent, we should turn our attention to it, and leave the disease itself alone for the time. Thus, in a case of colic, we should turn our attention first to relieve the violent pain, even though the condition causing it is thereby adversely affected. Again, we should postpone a venesection (otherwise indicated) if the stomach were in a feeble state or if there were diarrhœa, or if there were nausea.

Sometimes we should do a venesection (for instance) without hesitation even though that would not remove the whole trouble. For instance, in a case of spasmodic disease, we should not empty out all the morbid humour, but we should leave some behind rather than risk losing some of the healthy humour, in the hope that this itself would cure the spasmodic movements.

THE SEAL OF THE WORK, AND AN ACT OF THANKS.

May this our compendious discourse upon the general principles pertaining to the science of medicine be found sufficient.

Our next task will be to compile the work
on Simples, with the permission of
Allah. May He be our
aid, and Him do we
thank for all His
innumerable
mercies.

THE END OF THE FIRST BOOK OF
THE CANON OF MEDICINE OF
AVICENNA THE CHIEF
OF PHYSICIANS.

BRIEF SUMMARY OF THE CONTENTS OF THE REMAINING BOOKS OF THE CANON

BOOK II.

MATERIA MEDICA, PHARMACOLOGY AND THERAPEUTICS.

PART I.—*General Principles.* The temperament or constitution of drugs, and how it is determined (a) by experiment; (*b*) by deduction. An account of all the actions which drugs may possess. The collection and preservation of herbal and other remedies.

PART II.—*The properties of each drug taken seriatim.*—The properties are classified under the following headings: General and detailed description, tests for purity, qualities, general actions in terms of the subject matter of Book I; special actions on each system of the body, or special diseases; specific actions; antidotal properties; alternative remedies or adjuvants.

The Latin edition gives 760 names, and the Bulaq gives 802 names. But the actual number of remedies is rather less, because some of the items are simply cross-references, the same drug being known under different names.

The second part of "*De viribus cordis*" fulfils the alternative title "*De medicinis cordialibus*" in being a careful account of the medicines acting on the heart, arranged on the same plan as the above, and constituting a useful supplement to the second Book.

The account of the individual drugs includes numerous quotations from various sources, notably Dioscorides.

BOOK III.

SPECIAL PATHOLOGY (in its modern sense). In this Book the various systems are taken up, and the diseases to which each is liable are discussed, giving etiology, symptoms, diagnosis, prognosis and treatment.

Special mention may be made of the following Sections:—

1.—Head, Eye, Ear, Nose, Mouth, Throat, Teeth.
2.—Chest, Lung, Heart.
3.—Alimentary Tract: stomach, intestines; liver, gall-bladder and spleen.
4.—Urinary system.
5.—Conception. Pregnancy. The uterus. Diseases of women.
6.—The Muscles. The Joints. The Feet.
7.—The following special subjects: The intemperaments of the Brain; Headache in all its aspects; various diseases of the Brain. Epilepsy. Paralysis.

Note that the Section on the Eye has been translated into German[30] (ref. in the Bibliography).

BOOK IV.

PART I.—*Fever* (considered in general terms). One-day, tertian, quartan, septic and pestilential (i.e., epidemic) fevers. The subject of Crisis. Symptomatology of Fevers. Suppuration. Lepra.

PART II.—*Minor Surgery*: Wounds and their general treatment. Injuries of nerves. Fractures. Dislocations. Ulcers.

PART III.—*Poisoning*: mineral, vegetable, and animal poisons. Bites from animals and man.

PART IV.—*Beauty Culture.*—The hair, the nails, the skin. Wasting. Treatment of offensive odour, or discoloration. Pediculosis, etc.

BOOK V.

THE FORMULARY.—This is a collection of careful recipes, with copious details on the proper way to prepare "compounded" medicines.

This book was translated into German by Dr. Sontheimer. (Ref. in the Bibliography).

(A copious index and glossary concludes the Latin Venetian edition (1595-1608) of the Canon, lists of drugs being given according to their action on the body and according to the diseases for which they may be applied.)

Continuation (from 173) of Translation of "de Viribus Cordis."

2. The Nature of the Breath, and its Purpose.

LIFE (**1086**) and every perfection, and every good* for which creatures* are destined, comes from nothing but the Primal Most High Truth—the source of all good, and from the Strong Desire ever proceeding therefrom.

1087. Nevertheless, the recipient thereof requires a specific capacity for reception of the good. A creature* cannot receive indifferently. For instance, wool cannot be wool (lit., have the "form" of wool) and at the same time have the characters of a sword. Water cannot be water (lit., have the "form" of water) and at the same time receive the "form" of human nature.

1088. All corporeal bodies may receive life except the four first principles, and whatever is of like nature to them. For these are non-living bodies, and are also of negligible bulk. In fact their bulk is infinitesimal compared with the planets, and still more strikingly so compared with some of the fixed stars. Indeed it can be shown that these first-principles in their totality have not as much bulk as a point compared with the body of Saturn ; how much less then are they when compared with the higher bodies ?

1089. Those who realize the Truth know the reason why these elementary bodies do not receive the "form" of life. Even the simplest of living beings is quite different from them ; and the celestial bodies, adapted as they are to a very wonderful kind of corporeal life, are very different from them also. The first-principles are entirely beyond the possibility of life.

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* This word is used in the Scholastic sense.

§265. It may be noted that corporeal bodies receive life when they enter into the composition of living matter, whether of protozoa or the like, or of highly organized animals and plants. The author does not say that all corporeal bodies are "forms of life," as some have assumed.—The distinction between matter and form already discussed (§§55-105) makes clear that which is expressed slightly differently in the preceding passage. It should be borne in mind that the first principles are really neither "matter" nor "form"; the discussion in the text is relevant only because the listener is supposed to have failed to realize this. Although the first-principles are co-terminous with the "infinity" of the universe, they have not either mass or volume. The comparison between a "point" and a "world" is characteristically mediæval.

1090. It is the mingling of substances in the compound bodies which accounts for their ability to receive life. The commingling of the components so modifies their contrarieties (cf. **20**) as to produce an *ensemble* (i.e., the temperament : cf. **27**), in which all the various seeming contraries (nothing is really absolutely contrary to anything else*) are blended harmoniously. The more harmonious the blending, the more adapted is the resultant compound for being the vehicle, not merely of life, but of a very particular kind of life. Perfect equilibrium and perfect balance renders possible the manifestation of the perfection of *rational life* which celestial beings possess. And it is just this kind of character which is to be found in the case of the human breath !

1091. The breath, then, is that which emerges from a mixture of first-principles, and approaches towards the likeness of celestial beings. It is a luminous substance. It is a ray of light.

1092. This accounts for the fact that the mind rejoices when it looks towards the light, and is depressed when exposed to darkness. Light is in harmony with the breath. Darkness is in discord with it.

3. The Chief Emotions in Relation to the Vital Breath. Their First Causes: Potentiality and Disposition.

SAGES (**1093**), and those physicians who agree with them, are satisfied that joy and sadness, fear and anger, are passions peculiarly related to the breath of the heart. Each of these emotions is maintained or discontinued (1) by the agent†; (2) by the persistence or cessation of the disposition exhibited by the substance of the patient.

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* A typical Sufi conception.

† Scholastic sense.

1094. Sages perceive a subtle distinction between potentiality and disposition, as represented in this table :

Potentiality.	Disposition.
1. Pertains equally to both contraries.	Does not.
2. One and the same person can be glad or sad.	Optimism and pessimism can only exist in distinct persons.
3. Is perfected into a disposition.	Is perfection of potentiality towards one or other contrary.
4. To pass one's life with a breath of sad or glad potentiality is one thing.	To pass one's life with a breath of sad or glad disposition is another.
5. Glad or sad potentiality can harmonize equally with the breath.	Glad or sad disposition does not.
6. Potentiality for both contraries is inseparably inherent in the breath from the very first.	Disposition towards a contrary (emotion) is not inseparably inherent in the breath from the outset but may appear under the influence of supervening agents.

4. Joy, and the Causes of Delight and Sadness.

JOY (**1095**) is a form of delight. A thing is delightful when it is the perfection of its corresponding faculty. For instance : the perception of a sweet or sapid taste, or a pleasant fragrance ; the overruling of a feeling of anger by a good judgment ; the realization of some useful outcome of the reasoning or imaginative faculty.

1096. There is a certain power accruing from every perfected delight. It is the perfection of the given power which produces joy.

"Delight is a perfection of operation" (Summa contra Gent., xc^{82}, p. 190).

"Joy and delight differ in aspect. For delight is caused by a good conjoined in reality, while joy does not require this conjunction, because the mere repose of the will in the thing willed suffices for the notion of joy. Hence delight is only in a conjoined good, if it be taken in its proper sense ; whereas joy is in a separate good." (ib. p. 191.)

1097. Some people have expressed the opinion that "delight" is really nothing but "the departure of abnormal disposition," and that there cannot possibly be delight where there is no possibility of going beyond the natural disposition. This view has arisen because there are some forms of power which cannot bring delight until some abnormal disposition has first been got rid of. Nevertheless, the opinion is wrong ; it takes a thing which is *per accidens* for a thing *per se*—a fallacy of reasoning which is mentioned in " the Definitions."

1098. Delight implies attaining a goal, and the one who apprehends it can only be aware of the delight because he is aware of the change. For instance (1) in the case of touch, it is evident that the quality of tangibility can only provide delight as long as the tactile organ continues to be in the opposite phase. Once the polarity has reached equilibrium, the character of the organ will have become "set," and cannot provide further change. From this time there ceases to be any sensation of pleasure.

(2) In the case of the hectic patient, who does not suffer from heat subjectively however high the body temperature may be ; a patient with an acute fever may feel hotter than the other even though his temperature be not so high. This is because in the hectic case, heat is already resident in tissues of corresponding constitution ; in acute fevers, it is as if the heat flew past, afraid of the manner in which it may find the elements mingled in the tissues. Doctors rightly consider the state of the members of a hectic case as " bad, though balanced " ; and in the other case regard the quality as " unbalanced and therefore bad."

It is clear then that pleasure ceases as soon as one is accustomed to the completed sense-perception because one can now no longer be aware of the entry of sense-perceptions. The reason why pleasure is experienced at the departure of an abnormal disposition is that one is now sensitive to the slightest change in the (now) normal disposition. It is possible that this sensitiveness to change in the natural disposition may appear synchronously with the departure of the abnormal disposition. People are then apt to think the latter was the cause of the former, when it is not so. The real explanation lies in the attainment of perfect perception. It is this that is the *per se*—the intrinsic basis of delight. (cf. The Theory of Pain: **432.**)

1099. In other words, the disposition towards delight depends on the constitution of the participating breaths, and on the degree to which the disposition is favourable to their presence, always provided that the substance of the breath is not diminished, and the disposition likely to be favourable is not an abnormal one.

1100. *Effect of quantity of breath.*—Should a breath with a tendency towards delight be abundant, its action will be correspondingly powerful. The greater the quantity, the greater its vigour, and the greater is the amount of it which will persist at the place of its origin—that is, in its "matrix." Consequently, under these circumstances it will radiate out in greater measure to the various members, and produce that particular state of expansion which spells joy and pleasure. For, if the breath in question were only moderate in amount, the substrate concerned would hold it greedily, and not allow it to expand as freely as otherwise would be the case.

1101. *Effect of the quality of the breath.*—The nobler the character possessed by it, and the nobler its substance, the more luminous does it become, and the more like celestial substance will it be.

§ 266. This passage is characteristically Sufic; the reference being to the effect of purification of the "breath" in the exercises culminating in "Shaghal"; the personal success and accuracy of the physician in his dealing with the sick being progressively enhanced the more the purification of his "breath" is secured. The rarefaction of the breath, and the replacement of coarseness by fineness, are desirable in all, but come from experience and not from study.

1102. Such, then, are the various points about the tendency towards pleasure and joy. As regards sorrow and grief, it is just a question of the converse. Once the general sources of delight and pleasure are thoroughly grasped, the sources of joy become intelligible, since joy is a form of delight.

1103. By way of summary, it may be said that when the breath residing in the heart is plentiful (as it is when there is plenty of that material from which it is rapidly and constantly being generated); when it is balanced in temperament; when it has a luminous, beautiful and bright substance—then there is a strong tendency to joy.

When the breath is scanty (as occurs in convalescents, in long-standing illnesses, and in old persons); when it is not balanced in character (as in morbid states); and when it is (*a*) very dense and coarse in substance (as in melancholy and old people)—it cannot arouse joy; (*b*) very delicate in substance (as in convalescents and in women), it will not allow of expansion; (*c*) confused (as in melancholy people)—in all these cases there is a very strong tendency to depression, sadness and grief.

Tabular Summary.

Disposition of mind.	Corresponding character of breath.	When met with
Cheerful	Quantity: plentiful. Temperament: balanced. Substance of breath: brilliant, full of light.	
Gloomy.	Quantity: scanty.	In convalescence, In prolonged illness, In old age.
	Temperament: unbalanced.	In disease.
	Substance: dense and gross.	In old age; in melancholy.
	Attenuated.	In women; during convalescence.
	Confused.	In melancholy.

5. The Extrinsic Causes of Delight and Sadness.

1104. When all the conditions required for a given act are present, the slightest agent will now suffice to effect the act. Thus, when sulphur is used for kindling, it is because sulphur is set afire by a moderate amount of heat, whereas wood cannot be made to burn without twice as much. So, when the mind has a breath whose tendency to receive the impress of gladdening agents is complete, a slight agent will suffice to evoke gladness.

1105. *Action of wine on emotions and on breath.*—This is shown in the instance of those who drink excellent wine, for in such persons gladness increases to such a pitch that onlookers wonder how they can be jovial without reason. Such a thing, of course, cannot be. No impression is possible without an impressor.

But the fact is that when wine is taken in moderation, it gives rise to a large amount of breath, whose character is balanced, and whose luminosity is strong and brilliant. Hence wine disposes greatly to gladness, and the person is subject to quite trivial exciting agents. The breath now takes up the impression of agents belonging to the present time more easily than it does those which relate to the future; it responds to agents conducive to delight rather than those conducive to a sense of beauty. It also takes up an impression from agents which are prone to evoke conjecture rather than from those which are concerned with real understanding. The explanation of this is that normally the power of the mind brings about an act in the brain such as will expel the breath (when it is in the phase of having a mild degree of moisture) ; the brain thus becomes able to obey the motions of the thought and the exercise of the faculty of understanding. In inebriety, however, there is a very great inclination towards excess of moisture (which is incompatible with obedience to the understanding), owing to admixture with ascending and overflowing vapours, which render it too humid. This moisture prevents it from obeying the intellectual faculty and the tendencies of the thought, except in respect of very material and corporeal topics. It cannot serve in respect of very delicate spiritual matters. Whether stable or agitated, moisture cannot take part in the formation or presentation of spiritual affairs ; it can only respond to corporeal ones.

1106. *Stages in inebriety.*—The following are the various steps of degradation of the mind, not arranged chronologically : First, recognition of truth is impaired, and the operation of the mind is imperfect. The intellectual power falls in proportion. The substrate continues to attract breath until the temperament of one has reached up to that of the other, after which the flow of breath of course comes to an end.

1107. The power of the mind (which is in the " heart ") has a greater affinity for joy during the state of drunkenness ; the gladdening things that come to it do not reach it by the usual route between the senses and the phantasy (or even the cogitative faculty), because the sensitive faculties have come into dominance. The repletion of the breath with moisture has altered its vigour. The senses now dominate the inner breath, and are more powerful than the understanding. The understanding (as for instance for geometry and other exact sciences), meeting as it does a breath which is so wanton towards it, readily submits to the senses. Things being so, no wonder that the conception of future, of beauty, of rational affairs, has become blurred in the intoxicated person's mind ; the sense-perception of sweet, glad, and delectable things prevails, and the sense of the present is very strong. It is the very strength of this tendency that accounts for the fact that quite a slight agent will evoke gladness and mirth. Onlookers think that such persons are jovial without reason. But this cannot be so. As a matter of fact, some causative agents of joy and gladness are powerful, while others are weak ; some are known and obvious, others are not known and occult. Many of the latter are not known, not because they occur only rarely ; they occur regularly. The fact is that we notice things less particularly the oftener we encounter them.

1108. It is now necessary to detail the powerful and obvious sources of joy and gladness. Instances of *sources of joy* are the following : (1) gazing upon the daylight, among cheerful people. The evidence of this is that being in the dark makes them sad. (2) Having intercourse with those of like beliefs. The evidence of this is that solitude makes such people sad. *Gladdening influences* are such as (1) obtaining that which is wished for ; (2) satisfying an intention without meeting opposition ; (3) preferring to do something peaceful ; (4) confidence ; (5) the memory of past and future joys and hopes ; (6) thinking about ambitious things ; (7) mutual argumentation with kindred minds; (8) relief from pain; (9) contact with curious (interesting, unusual, remarkable, new) things ; (10) uplifting of the mind ; (11) meeting friends and friendly surroundings ; (12) overcoming deception in small matters : and many similar things to be found mentioned in books of rhetoric and morals.

Compare also the following : "All the passions of the irascible appetite rise from the passions of the concupiscible appetite and terminate in them ; for instance, anger rises from sadness, and having wrought vengeance, terminates in joy" (St. Thomas[84], 81, a. 2 ; p. 130).

1109. All these vary in different races according to their affections, habits and ages. None of them is invariably absent. If two agents usually having a gladdening effect occur together, the effect is not so much the greater. All that happens is that the disposition is more drawn to one than the other. The effect of one only overrules that of the other if the agent in question be very powerful, or, if it be weak, only if it be very persistently at work. (Cf. **1115**.) This accounts for delight being able to persist during the state of inebriation, and for the fact that melancholy persons with confused breaths keep sad after agencies producing a sense of desolation and sadness—such as the following: (1) reflecting that one's fatherland is distant ; (2) pondering over many injuries already past and done with ; (3) hate and rancour ; (4) bad health ; (5) difficult circumstances of life ; (6) thinking terrible things are going to happen in the future ; (7) thinking of the necessity for death, which natural judgment ignores because of the obvious fact that we must die ; (8) thinking about something that it is disturbing to meditate upon ; (9) being away from an agreeable occupation ; (10) having thoughts that distract from one's occupation ; (11) distraction from that which is desired for and wished for ; (12) many other similar things, and others which are beyond comprehension. Things of this sort easily sadden a mind which is disposed to become sad.

Moreover, in melancholy persons, the vividness of the imagination of depressing things itself causes them to appear, because the thing whose image is represented to the mind is already there in actuality. Hence depression persists.

1110. Vividness of imagination goes with dryness of the breath, the movement of which the will has power to correct. We find that the understanding is drawn away from rational actions by the senses and by the phantasy, whenever the character of the breath is perverted ; for the breath moves characteristically towards that direction in which a lack of congenial disposition arises, as when the quality of the breath is very bad, and when it is confused.

6. How each Emotion tends to Generate its own Type of Breath.

1111. It is not to be thought that every agent tending towards joy or depression necessarily depends only on the quantity or quality of the substance of the breath. Other agencies are concerned. For instance, the emotions of the mind have to be considered. These tend to one or other of the aforesaid, true though it be that they act through the agency of factors intrinsic in the breath itself (namely, quantity, quality). They do this by modifying the temperamental substrate or by rectifying the breath or by increasing its quantity. Thus, they dispose towards joy.

On the other hand, an agent of opposite sign will tend to induce depression.

These are the immediate and remote *external factors*.

1112. The *intrinsic factors* are traceable to one single source, because every act of contrary type, if it be repeated often, comes to be more efficient in imparting an effect. Every increment of power carries with it so much more tendency to the accomplishment of the effect. This is sufficiently plain from a purely logical point of view. A body which is very heating tends to impart heat rapidly ; and similarly in the case of cold, rare and dense bodies. The same holds good in the case of the internal potencies. This is how it is that a strong character is formed by repeated practice and repeated experience of emotions. It is in this way that moral character is acquired.

Perhaps the reason underlying this is that when an emotion appears, it often makes the substance of the breath become conducive ; and what is suitable for one thing is unsuitable for its opposite. The oftener it is repeated, the less does the tendency to the opposite become, for that which is conducive to the opposite, is expelled little by little. This is saying the same thing as logic says. It would be tedious to prove it by syllogism by an acceptable and convincing argument from known premises.

It emerges from the aforesaid that a reiteration of being glad disposes the breath to a state of gladness ; a reiteration of being sad disposes it to depression.

1113. Natural enquiry shows the source of increase of gladness to depend on (1) a strengthening of the natural faculty : (2) a rarefaction of the breath. The latter is due to the expansion following gladness.

(1) The strengthening of the natural faculty is contributed to by three factors, each of which is itself a source of gladness :

(*a*) the temperament of the breath ;

(*b*) over-production of breath beyond that which is lost by dispersal ;

(*c*) prevention of excessive dispersal of breath.

(2) Rarefaction of the breath is followed by two things :

(i) a tendency towards movement and expansion. This is related to the fineness (rarefaction) of its substance ;

(ii) an attraction to itself of its own particular nutriment. This is due to the movement of expansion towards a place away from the movement of the nutriment. This particular attraction is really the natural corporeal tendency to avoid emptiness.

In its essence, it is the same with any movement which in itself brings it to pass that the latter things shall take the place of the former. It is the outcome of this law that very distant waters are drawn towards their primary source, and that winds follow the course they do.

1114. Two things follow great depression : (1) weakening of natural power ; (2) concentration of the breath. The explanation of this is that violent condensation and aggregation of the breath obliterates the natural heat and results in coldness.

Two opposites follow upon this, as has already been intimated.

1115. It is therefore evident that intense gladness disposes the breath to gladness, sadness to depression ; that associated depressants do not make an impression on gladness unless they are vigorous ; whereas weak stimulants may and do impress themselves thereon.

It is, of course, the other way about in the case of depressants.

7. THE DISTINCTION BETWEEN WEAKNESS OF THE HEART AND COWARDICE; SADNESS AND THEIR OPPOSITES.

1116. Weakness of the heart and sadness, which some people call "contraction of the chest or heart," are similar and yet different. The same thing may be said about their opposites (vigour and gladness of heart), which some people call "enlargement of the chest or heart" [cf. Ps. 118, 32; 2 Cor. 6, 11]. The difference between them is difficult to identify because so commonly one passes into the other. Most people think the two former are passive dispositions; others think they are active. But there is an obvious difference between the extremes of each.

Firstly, not every weak heart is associated with depression, nor is depression always accompanied by weak heart. A vigorous heart is not necessarily accompanied by joy; and conversely.

Secondly, the *basis* is different in each. Weakness of the heart is a disposition assumed in respect of things-evoking-dread, because it is incapable of tolerating them. Depression has to do with saddening things and the heart does not tolerate them much. Fear concerns the body; depression concerns the mind.

Thirdly, there is a difference in regard to the *mental effect*. Weakness of the heart impels to flight, depression impels one to stand still for the purpose of either resisting or repelling. This is the opposite action to flight. Weakness of the heart inhibits the powers of motion, depression stimulates them. Consequently there are two emotions associated with weakness of the heart: (*a*) that of threatening injury; (*b*) that of desire to prolong movement. In the case of depression (oppression of the chest) there are (*a*) sense of threatening injury; (*b*) no desire to flee. In the event of there being a decision to flee, it is because of some contingent circumstance rather than because of an intention to give ground. It is as likely that attack and struggle will be decided upon in place of flight.

Fourthly, they differ as to the *after-effects on the body*. Weakness of the heart and escape from the danger are followed by loss of natural heat, by cold. Depression, after the particular cause has passed away, is followed by kindling of the natural heat.

Fifthly, they differ in regard to the *disposing causes*. Too fine and too cold a complexioned breath tends to weakness of the heart, coarseness and hot temperament of breath tend to depression.

8. The Relations between the Various Blood-States and the Several Emotions (1117).

Blood.	Effect on breath.	Effect on emotional state.
Plentiful, bright, hot.	Oxidative processes active ; Movement swift.	Tendency to anger.
Plentiful, bright, attempered.	Abundance of clear breath of laudable substance, and attempered.	Tendency to delight.
Bright, watery, cool, tenuous.	Oxidative processes slow ; breath heavy ; moves centrifugally ; less is formed ; more is dispersed.	Tendency to fear ; neither joy nor anger ; heart tends to be weak.
Thick, turbid, over-hot.	Breath turbid ; as the blood tends to "inflame," the breath thickens, and fails to cool properly.	Tendency to sadness and even continual vexation. Therefore the emotion persists.
Rarefied ; bilious humour increased.	Breath of intense heat, and rarefied	Anger, which comes and goes.
Ditto, but also bright and clear.		Joy.
Thick, but not turbid (rarely met with).	Thick, but not turbid.	Not sad, but stron and bold. Very little anger because joy neutralises this (1).
Thick, not turbid, cold.	Thick, cold, not turbid.	Timid, dull ; upright.
Thick, turbid, cold.		Gloomy, solitary ; a person of rancour and resentment ; anger arises only at great provocation (2).

Note 1.—Joy easily overcomes the emotion of anger. It is sadness that fosters anger. For anger is an impulse to expel. Happifying things harmonize with pleasure, and pleasure entails a tendency to attract or gather in. So it will need a big thing to make such a person angry ; and as a very concentrated breath will result, there can be very little fear.

Note 2.—The anger will not last as long as it would in hot-blooded people (in whom other like conditions are associated), but longer than it does in persons whose blood is rarefied. So he comes to be a man of resentment, because the disposition to hate implies the persistence of hurtful images in the imagination.

1118. *Part played by imagination in emotions.*—The persistence of an imagination which is disposed towards taking vengeance for a thing is related to persistence of anger, although there is not sufficient propulsive power to execute the vengeance. The anger is neither marked enough nor mild enough. For it must be understood that when anger ceases quickly, the hurtful image does not persist in the imagination, but is quickly destroyed ; so rancour becomes impossible.

In like manner, too much tendency to secure vengeance is countered by two factors : rancour and hate. The one is due to the mind being wholly impelled to vengeance, but prevented from continually reflecting upon the hurtful conditions by remembering the things which follow upon having hate fixed in the memory. The mind naturally hesitates to face impending hurts. Externals tend to draw away from internals and vice versa.

It must also be remembered that when there is too much tendency to vengeance in a fearless person, the impression results as if the imagination had already become possessed of the thing desired for. In aiming at the realization of a power, and hastening towards it, the imagination of such a person takes it as actually handled. The image is impressed on the imagination as if actually present ; then the image of the thing in which the purposed action will end is added to the imagination, and the desire for it ceases to be maintained ; the image is abolished, and therefore does not linger in the memory. That is how it is that rancour is not there.

When the noxa is big, as where a sultan or very high dignitary (usually looked on with fear) is concerned, then the urgent anxiety to gain vengeance, coupled with the fear, together prevent the image of the desire from staying in the mind. The result is that the picture of the desire and of the noxa are both abolished from the imagination, whereas the image of the *fear* is so much the more dominant to the mind that it evokes a desire to flee and not attack. Here again, the image of rancour cannot persist in the mind.

In the case of persons under puberty, or weakly persons, it is so easy to take vengeance on them, and there is so little fear entertained of them, that the vengeful mind pictures the vengeance as if already accomplished. Excessive ease in securing vengeance makes it pictured as if already in one's hand. The imagination acts not according to what is in the matter at issue, but according to that which it pictures to itself. So, when ease of fulfilment arouses the thought that vengeance is attained, the weak-minded person takes it as actually attained. So the love for it vanishes and is entirely obliterated from the mind.

Moreover, that the imagination moves according to that which is represented to it and not according to the outcome of things, is shown by the fact that men dislike honey when it is served up like bilious matter ; and they dislike laudable sapid foods should their colour be made like repugnant substances : or even when they are served in the appearance of repugnant objects, even though such things are not believed to exist at all.

Similarly with this : when a given likeness to the above-named thing is portrayed (either because of the intensity of the impulse of the desire, or because of the worthlessness of realizing the desire—as though it had actually been attained) it has the same effect as if it had been realized ; therefore there is no rancour.

From what has been said in the preceding chapter, it is evident that the last-named kind of temperament is that which is most disposed towards rancour.

9. How the Appropriate Medicines Stimulate and Strengthen the Breath.

1119. We can now understand how the appropriate medicines can stimulate. Wine, for instance, restores the breath by nourishing it ; pearl and silk (which counteracts disagreeable things) supply the breath with brilliance and luminosity. Emblic myrobalan, amber, and coral concentrate the breath or prevent it from dissipating rapidly ; doronicum modifies the temperament of the breath by giving it heat, camphor and rose-water do so by imparting cold ; sweet aromatics strengthen the breath by endowing its substance with agreeable and sweet fragrance ; bugloss and lapis lazuli act by separating off black bile and fumosity. Changes are produced by adding or removing a drug ; e.g., coral may be joined with amber and bugloss.

In some cases, gladness is the outcome of the intrinsic property of the drug. This is so in the case of sumbul. In other cases, the intrinsic property of the drug produces its effect indirectly by acting upon one or other of the primary causes of gladness. Thus, musk and amber act on the breath by way of their aromaticity. The juice of matian (**359**) gives rise to gladness in virtue of an intrinsic property. But when used in a case where the temperament of the breath is hot, the stimulant action is effected by way of infrigidation. When the temperament of the breath is cold, doronicum acts as stimulant both in virtue of its intrinsic property and by imparting warmth to the breath.

1120. In dealing with all these drugs, then, it is necessary to know whether the properties are general or specific. When the property is general there is no need to make any modifications in employing it for weakness or depression of the heart. An instance of such an agent is afforded by aromaticity. On the other hand, where the property is specific, it requires modification. For instance, the juice or syrup of matianus is cold, and will stimulate one kind of temperament but not another. If it be desired to use matianus to make a person of cold temperament glad, it is necessary to counteract its coldness by a calefacient ; and it would be more efficient to choose a calefacient which itself is intrinsically a stimulant. For instance, musk or amber is mixed with syrup of matian, because they supply both warmth and stimulating power.

Aromaticity and sweetness are potencies which, though opposite, are yet attracted towards qualities which are agreeable to the substance of the breath. They supply the taste and fragrance which the natural and vital power respectively desire to receive.

Where two drugs are of equal power, the sweeter and more aromatic of the two will prove a more efficient adjuvant, because these properties are more attractive to the members (especially the liver). Should nutrient properties be present as well, the breath is more rapidly nourished ; and being medicinal in character, it acts more rapidly on the breath.

These indications guide as to which drugs to use to obtain a more rapid effect.

1121. The essence of aromaticity lies in its rarefaction ; the essence of sweetness lies in its concentration and earthiness. This explains why aromatics are so much better adapted to feed the breath, while sweet substances are better fitted to nourish the body. Consequently aromaticity is more efficient for the heart than sweetness, while it is the other way round in the case of the liver. The heart is the matrix of generation of the nutriment of the breaths, whereas the liver is the matrix of generation of the nutriment of the body. That is why it needs less aromaticity and more sweetness to nourish it than does the heart. All the same, aromaticity *is* required by the liver, because that organ is the matrix of the natural breath—not a matrix of *generation* of breath, only a substrate for the breath to reside in (according to those acquainted with the truth ; not according to those who merely speculate.)

The natural breath has a desire for aromaticity and is invigorated and refreshed by such. It is easy to see that the natural faculties will also be invigorated in consequence.

10. WHAT "PROPERTY" IS, AND HOW IT DIFFERS FROM "NATURE."

1122. Strictly speaking, the specific "property" of a thing is the same as its "nature." The one term would really be defined by the same words as the other. The specific property is the source of movement or rest in whatever things it occurs.

Nevertheless, there is a difference between the two conceptions, in the same way as the particular differs from the universal. It is not true, as the laity think, that the two terms belong to opposite things. The truth is that the first-principles behind all generable and corruptible substances are primary active or kinetic energies, and occur either simply in fire, air, water, and earth, or linked to a composite temperament.

1123. There are two views about this : (*a*) that the disposition appears synchronously with the production of physical form ; (*b*) that the disposition is inherent in Matter from the outset. Once matter assumes a given physical form, it can only assume some other form by dispersing the first form. That is, Matter relapses to the natural power of the disposition.

1124. Whichever view is correct, it is true that from such a physical form (whose constituents have become so to say blended) there emerges a power which could not have appeared in the several separate constituents. For instance, the attractive power of iron in a magnet is not in any of its component powers. It arises out of the divine emanation which pervades all things and makes latent energies kinetic. This happens in one of two ways : (i) by means of something primarily inherent in matter ; (ii) by means of the temperament which itself disposes it to receive the given power, and is yet itself neither power nor physical form.

1125. We now have the answer to the questions, what is "specific property" ? What is "nature" ? If one asks, "Why does fire burn ?" one must needs answer "because the thing burning has a combustible nature." If one asks, "why does a magnet attract iron ?" it can only be said, "it has an attractive power by nature." To say that fire burns because of heat is no better than saying a magnet attracts iron because of having the power and nature to attract iron ; we may say the nature of the energy called " heat " is to burn up in fire, and call this " combustible nature," " combustible power," but there is no name for the other. The giving of a name has not imparted complete knowledge about the matter ; to know the name does not remove the real lack of knowledge about a difficult phenomenon.

1126. But people are not usually satisfied by the preceding answer because they want to believe that every property arises out of the " heat," " cold," " dryness," or " moisture " of a body, in virtue of heaviness or lightness or movement or of any of the things which are obviously really dependent upon the components. When they find that actions are not to be atrributed to any of the aforesaid, and that the real reason for an act is not apparent, they come to the conclusion that every one of the first beginnings is inscrutable. That is not true. Actions proceed either from natural or vital or intellectual or accidental (contingent) properties.

1127. We may pass over as untrue the other theories held about magnetic force—that it attracts iron because of (1) heat ; (2) cold ; (3) a spirit residing in the magnet itself ; (4) sending out hook-shaped bodies ; (5) likeness between the nature of the magnet and the nature of the iron ; (6) a vacuum in the iron. The fallacy in all these ideas is easily seen when we reflect on how a green twig acquires nutritive properties from its constitution, which is the same sort of thing as the reception of magnetic properties from a constitution in the iron. What is not understood is why the magnetic power is so much greater in iron than in any other thing ; yet this ignorance is no greater than that which exists in reference to other matters.

1128. This ignorance is in two directions : (1) we do not know the initial factors which go to produce this attractive power. Neither do we know them in regard to any other force. (2) we do not know why this body is more disposed to take on magnetic power than any other body. But neither do we know more in regard to other phenomena. We are in exactly the same case concerning colours, fragrance, powers of the mind, and such like matters. Of course we can say that all such phenomena arise out of the active principles originally blessed by God, and we can allow that the basis of the disposition which comes from the particular constitution is due to a re-arrangement of Matter. But though we may guess that it is the proportions of ingredients which account for the existence of a temperament, it is quite another thing to be definite about the absolute proportions of this commixture, and we shall be ignorant of this as long as we live in this world. So it is evident that our ignorance of the real causes of the power in the magnet is not as remarkable as our ignorance of the real causes which dispose the corporeal or mental body to redness or yellowness.

1129. The fact is that we take little interest in the common things of life ; the mind neglects to study them ; so often is it true that the rare things are the ones to excite admiration and be enquired after and their causes speculated about.

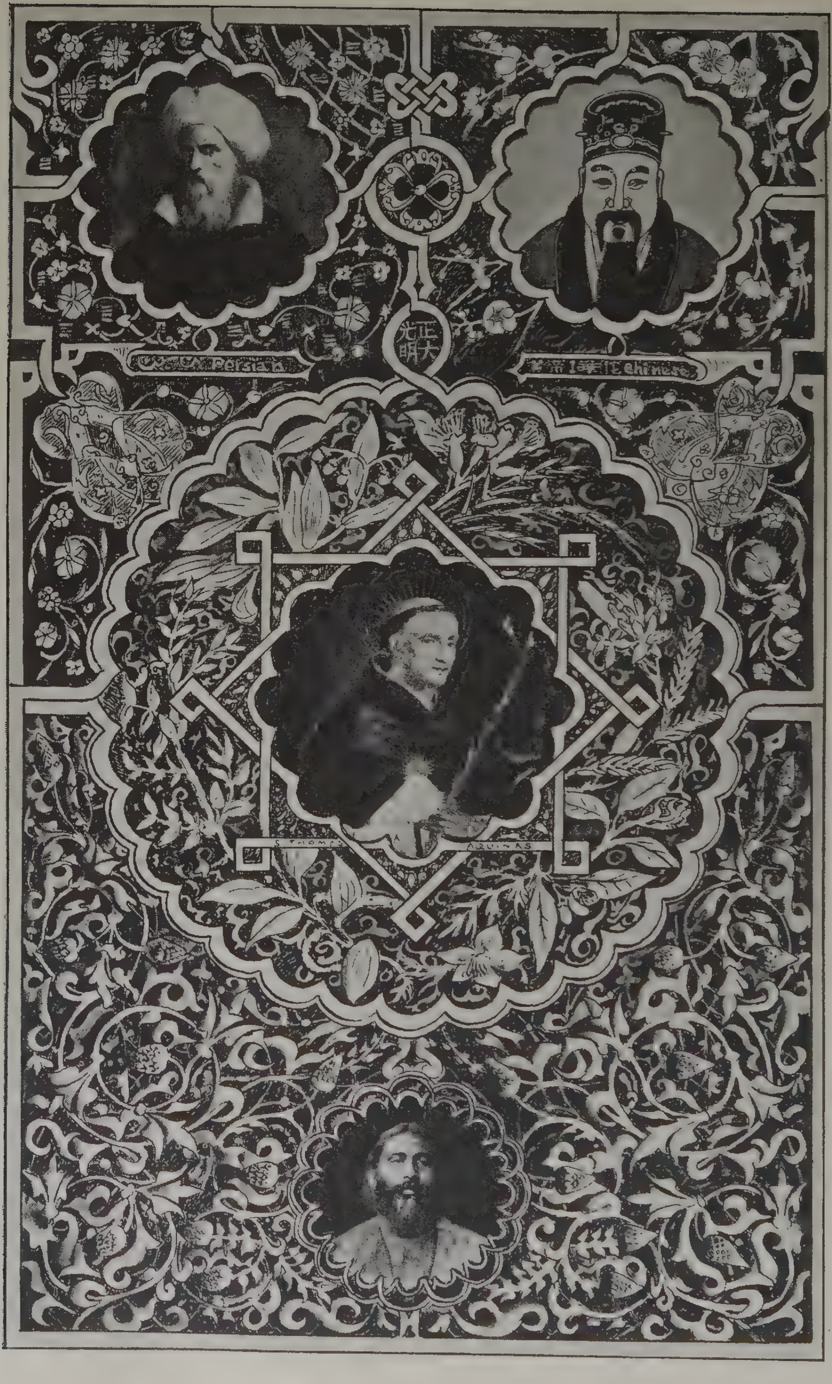
1130. *Conclusion.*—" Specific property " is the " nature " met with in compound substances after a characteristic temperament (and its correspondingly special and characteristic state) has been initiated in them out of the supreme and limitless " influence." This is the real truth about " specific property " (individuality).

In spite of this being so, it is common for people to say that specific property differs from " nature " in that the former appears in complex bodies after a special act has occurred to make its nature manifest. On the other hand, the " nature " of a thing is said to be the power by which simple bodies are operated. This is as far as the laity and feeble searchers-after-truth can see.

Now, if Fire is a difficult thing to make, and is carried from distant places, surely the laity might wonder at the specific properties of this more than of other things, and look more closely into the causes of its specific property than they do into those of other phenomena that appear to be more remarkable. To think how Fire removes visible forms, cannot be touched, rises upwards, makes the things over which it can prevail ascend, can be generated from a small quantity in large amounts within an hour, destroys whatever it meets and transmutes it into its own essence, is not lessened by however much is taken from it ! —surely these facts are more wonderful than the attraction of iron by a magnet, or than other specific-properties.

But, being so common, seen so much every day, these things evoke no admiration. There is no interest displayed in seeking their explanation. The action of the magnet seems extraordinary and receives universal wonder, and everyone is interested to enquire into its nature, and origin.

(This completes the first part of this tractate. The second part presents a classification of the drugs acting on the heart, and a description in detail of their characters and properties and uses, and shows how to combine them in the best manner appropriate for the varying temperaments which the physician is likely to meet. The plan is the same as that of the Second Book of the Canon, so that the two would be usefully considered together. But an attempt to do this in this treatise would unduly add to its bulk, for which reason the translation necessarily closes here.)


Persian
正大
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S THOMAS
AQUINAS

Frontispiece

CONCLUDING SURVEY

I

DURING (§267) the past fifty years, the popular imagination has been stirred by a succession of important discoveries in the domain of medicine and surgery. The triumphs of the latter field have been spectacular to a degree. Those of medicine have been much less conspicuous, chiefly because the mind must enquire into them before it can properly appreciate them. How much does not humanity owe to the steadily continued researches in bacteriology, and the painstaking observations which have revealed the life-cycles of many of the parasites to which tropical and other diseases are due? and to the whole procedure of immunotherapy, the just pride of scientific as distinct from clinical medicine, and the outcome of all these researches?

§ 268. As compared with all this, the speculative subtleties of former times appear both futile and unworthy of resuscitation. But the ancient system was not as valueless as is so generally supposed. Taking as an adequate criterion the first book of the Canon of Medicine of Avicenna, which is here presented almost in its entirety, and is fairly representative of the whole work, we find in its pages references to many departments of human knowledge*—cosmology, anatomy, physiology, and psychology; the various branches of clinical medicine—etiology, semeiology, diagnosis, and prognosis; the departments of therapeutics—hygiene, dietetics, balneology, and climatology, in addition to materia medica, pharmacology, and pharmacy. Moreover, the reader is presumed to be conversant with logic, criteriology, and metaphysics.

§ 269. The presence of obvious literal errors in the work must not lead us to commit the more serious mistake of overlooking the fact that it is entirely built up upon a sound philosophy of human nature, which is as vitally important to-day, though largely ignored, as in former times. The ancient medicine was concerned essentially with the given *patient now before us* ; whereas now it is simply the science of diseases which it is our duty to diagnose accurately, prevent if possible, and treat on lines capable of wholesale application. To Avicenna, the determination of the constitution of the patient was of the very first importance, for on it depended the character, course, and duration of his illness, and upon that again depended the choice of remedies.

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* Though it might be objected that all these departments of knowledge are now separate sciences, each requiring its own professorial staff, its own literature, and journals, and that they are not mentioned under the special names with which we are familiar, their existence in those days cannot be denied.

§ 270. After all, from the patient's point of view, the real object of consulting a medical man is to be restored to a state of well-being. It is little comfort to be (virtually) told that 85-90 per cent. of cases of his complaint are cured by the treatment adopted in his case, only to find that he proves to be one of the remaining 10-15 per cent. for whom there is litle or nothing to be done. True, his sighs are drowned in the shouts of the fortunate, and fail to reach the clinical laboratory, surgical wards, consulting room or research councils.

If in the interests of these few, chance leads us to the pages of this ancient work, it would seem that suggestions occur in it which enable us to understand their plight, and thereby help them to understand it also. Even if the enemy is not put out of action, his enmity is less evident when he is understood.

§ 271. It has been the aim of this treatise to elaborate Avicenna's central theme by references to the various philosophies extant in his time—Sufic, Vedantic, Buddhistic, Chinese ; to Persian writings subsequent to his time (Rumi, Sa'di, Shabistari, etc.) ; and to views presented by various modern philosophies, including western theosophy.

But these various directions of thoughts are not drawn upon in order to elaborate a composite system after the fashion of theosophical eclecticism. On the contrary, readers accustomed to various modes of thought are invited across a bridge leading from their various starting-points, across the chasm of modernism, until they reach the concise teaching of Thomistic philosophy, wherein all other aspects of the one truth receive their proportionate places. The inclusion of ideas from writers who appear to be altogether in bye-ways may torment a few, but may also help a few to see the greater thing, and thereafter be content to stay upon the broad highway to which the several paths have converged.*

Science has been removed from its usual rôle of master, and has been pressed into service ; and that service is to illuminate the subject of human nature. To quote a recent paper (Altounyan, Lancet, 1928, ii, 684) : " under the great swelling flood that represents the growing complexity of modern medicine, let us not allow ourselves

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* This aim is represented in pictorial form on the Plate introducing this survey. The upper left portrait reproduces one of Avicenna ; the upper right portrait is of a famous ancient Chinese doctor. The bottom portrait is one of the late Inayat Khan, to whom the author owes his introduction to the subject of the Canon some years ago. The centre of the plate fitly gives a portrait of St. Thomas Aquinas [by Luini, Milan, taken from " Dominicana," March, 1927]. In this way the scholastic philosophy is suggested as the natural end of varied but converging lines of thought.

to be submerged. Let us hold fast to that great life-saving conception of the essential unity of the human body. Let us oppose fearlessly those currents of medical thought that tend to isolate, arbitrarily and to the detriment of true knowledge, the various segments of this one great subject. Let us welcome all methods, all discoveries, that help the one man in charge of the one patient to broaden the base of his attack, to widen the sweep of his beneficent vision." These words were possibly expressed with a different object, but apply well to the theme of this treatise. The old teaching about " constitution " should undergo a mutual intergrowth with the knowledge of modern science, pervaded throughout with the fundamental teaching of Thomistic philosophy, when there would emerge the beginnings of a possible *system of modern scholastic medicine*—thoroughly logical, plain, free of mystery, free of materialism, but not ignoring the so-called " occult " and metaphysical ; with the knowledge of the nature of the constitution of the individual patient as its central and dominant theme.* Were the whole medical training along such lines, the student would be able to approach his clinical instruction thoroughly aware that the individuality of the patient comes first, and that the ailment from which he suffers is but part and parcel of one single story, and not merely an accidental superposition. But the student would constantly need guidance to ensure his over-riding the disregard or ignorance, if not actual rejection, of scholastic principles which characterizes the concrete modern teaching of pathology in its various departments.

II

§ 272. The following brief survey of the most important teachings of the Canon reinterprets them under three headings : (1) the general notion of the nature of the human being ; (2) the notion of the constitution of any individual when in health ; (3) the notion of the nature of the state of disease. These together provide that clear mental idea of " the patient before me " which is essential before I can effectively treat him.

(1) *The general notion of the nature of a human being.*

The following three propositions belong to it : (i) The human being (*MF*) is composed of matter and a principle of life, the two together making him " he " ; or, he is " a single substance endowed with a natural tendency to realize and maintain the conditions of its organization."—(ii) This principle of life comprises three main groups of potential and actual activities—the vegetative, the sensitive and the rational. This multipotentiality of the principle of life is represented in the expression " bundle of life."—(iii) The organs of the body are the material manifestations (the actualities) of the several potentialities. The vegetative organs belong to the " vegetative soul," the sense-organs and appurtenances belong to the "sensitive soul." The intelligence and will belong to the rational soul, which has not literal organs but acts through the instrumentation of the organs of the vegetative and sensitive systems. All these components belong intimately together apart from macroscopic or microscopic boundaries.

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* This sketch of the scope of medicine on a scholastic basis purposely excludes reference to ethical principles.

These propositions are further defined by the following negative statements: (*a*) The human being is *not* a collection of molecules and forces; he manifests chemical, electrical, and other phenomena, which are *not* causes, but effects. (*b*) The organs are *not* distinct from the powers they exhibit. (*c*) The brain is *not* the producer of thought.* Thought is produced by the activity of the rational soul; the changes in the brain—whether chemical, cytological, or otherwise, are *not* causes, but the visible effects of the activity. (*d*) There is *no* bridge over the gulf between rational life and the vegetative-sensitive life; the distinctions are radical. (*e*) The life-principle is *not* subject to the laws of inheritance, those which govern matter; it is *not* divisible into organs, or parts, or elements. As soon as it ceases to operate, there is left behind the material body, which though apparently the same is actually quite different from the animate person recently before me.

(2) *The notion of the constitution of any given individual when in health.*

This notion should be made as tangible as possible. Extending the remarks of § 27, the constitution may be expressed in terms of a number of formulæ† to be taken together—a series of "notes," some of which are constants, and others variables.

I.—THE CONSTANTS. (A) The *body*. (*a*) General physique [good, poor; robust, spare; strong, delicate]. (*b*) Dominant "element" [Ex.: $E^2W^2F^5A^3$]. (*c*) Dominant "humour," shown in the humoral formula [Ex.: $S^3L^1B^5A^2$—for sanguineous, serous (lymphatic), bilious, and atrabilious]: this formula is really descriptive of the "temperament," but the latter word bears a different meaning in modern popular usage. (*d*) The absolute or relative strength or weakness (functional capacity) of the several organs; hypo-, hyper-function. Example: $V^4T^4M^2O^3N^1G^3$, for vegetative (i.e. alimentary), thoracic (i.e. respiratory and circulatory), muscular (incl. skeletal), osseous (incl. genito-urinary[138]), nervous (incl. sympathetic system) and glandular (incl. haemopoietic, endocrine, and hepatic) types.[138]. (*e*) The emotional make-up, or formula. Example: $G^3L^2T^1I^5$ (gaudium, laetitia, timor, ira: § 160, III), from which the dominant passion and its modifiers are noted. The modern use of the word "temperament" belongs here.

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* The remarkable actions which man achieves by his complicated mechanical contrivances are distinct from himself, whereas in the human being the mechanism and the manipulator are the selfsame. Even when there is as grave mechanical interference with organs as occurs in hemiplegia, or in the cortical lesions of insanity, the rational soul remains untouched, though no longer able to communicate its activities to the outer world.—To quote St. Thomas: "the intellect, being a power that does not make use of a corporeal organ, would in no way be hindered in its act through the lesion of a corporeal organ, if for its act there were not required the act of some power that does make use of a corporeal organ."[84] (p. 177.)

† In the supposititious formulæ given, the *qualities* are represented by the initials of their corresponding names; the *quantities* are represented by index-numbers from 1 to 5, to stand for slight, moderate, normal, marked, and very marked respectively.

The difference in capacity is partly explained by considering the *time-factor* (**233**, **768**, § 247), and partly as a fundamental difference (**45**). All the material brought to an organ, whether nutritive, or excretory, is not at once taken up in its entirety; only a certain proportion is removed and the remainder passes on, so that the blood has its composition at a certain level. The modern "threshold values" recognize this fact. The time-factor is of very great importance.

(B) The *mind*. Here comes the description of the disposition, the type of mind, or mental make-up (§§ 78, 161, 164). Mental capacity may be expressed in terms of the relative or absolute strength or weakness of the various faculties, enumerated under "talents" (which are simply developments of particular faculties above the average) in § 164 (V).* The mental attitude towards things, which emerges from the character, is also to be noted, for sometimes this may explain the cause of the illness (e.g. wanton exposure to infections in spite of warnings), and will show whether the patient is suppressing relevant facts, will respond to treatment, or is secretly concerned with some fear or doubt which is the real object of his visit to the doctor. Moreover, knowledge of this aspect of character will safeguard the physician himself, either by making him aware of the patient's possible cynical opinion about a profession he is unfortunately obliged to deal with, or, more important, by enabling him to avoid offering advice which is palpably foolish to an intelligent patient.

II.—THE VARIABLES. (i) The *degree of vitality*. In the text, this is also spoken of as strength of innate heat. See also under "breath" §§ 136, 141; and its phases and cycles (§§138, 209). (ii) Deviations from the functional capacities normal to the individual. (iii) The nature or *degree of "resistance*." In terms of the Canon, this would be expressed in the "humoral formula," and in terms of "obstructions" of various kinds. These account for the "soil" which renders declared disease (*a*) possible, (*b*) amenable to alteration by artificial means. (iv) Other cycles (**296-301**, § 138, 183).

Foreign though such data are to modern clinical work, they are often actually employed in ordinary conversation, as when one describes a person as sanguine, or bilious, or phlegmatic, or as of saturnine temperament. Some adjective descriptive of the emotional-make-up is not infrequent in case-reports. Degrees of vitality are spoken of, seriously by the laity, diplomatically by the practitioner. In so far as they provide a simple means of codifying tentative knowledge upon complex and elusive individual characteristics which it is our duty to notice, the data are all worth consideration.

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* "The better the disposition of a body, the better the soul allotted to it; which clearly appears in things of different species: and the reason thereof is that act and form are received into matter according to matter's capacity; thus because some men have bodies of better disposition, their souls have a greater power of understanding. . . . This occurs in regard to the lower powers of which the intellect has need in its operation: for those in whom the imaginative, cogitative and memorative powers are of better disposition, are better disposed to understand." (Sum. Theol.[84] p. 203.)

(3) *The notion of the nature of the state of disease.*

§ 273. The vegetative processes associated with digestion and absorption of food may be first briefly referred to. As suggested in § 27, the picture of the whole nutritive cycle is comprehended in the idea of the "liver." We trace the food-constituents through the columnar cells of the intestinal mucosa, across the areolar tissue into the vascular roots of the portal and lacteal system; then into the liver-unit itself (comprising phagocytic secretary cells, fundal cells, cubical excretory cells, and the hepatic arterioles and lymphatic clefts related to the sinusoids). Then into the general blood-stream, and finally out of the body through various organs, including the goblet cells of the intestinal mucosa, the bile-ducts, the pancreas, etc. The extra-hepatic portion of the cycle is nearly co-terminous with the rest of the body.

To complete this picture we first remember the relation between quality of food and quality of chyme; then we consider how the ultimate components of the food travel (N-compounds, glucose, fat, phosphorus, sulphur, iron, and the like)—during rest, exercise, sleep, etc.; and according to the character of the diet as a whole, the fluids taken, and the state of the bowels, etc. We may realize that they are manifested in the blood in the form of alkaline tide, viscosity, fibrin-content, and the various morphological changes revealed by blood-examination. We picture also the innumerable chemical interchanges and physical transformations in various parts of the cycle; the formation of waste-substances, and the factors on which the whole of the processes depend. (§§ 88, 105). In brief, then, our picture of the body is that of a complex of tubes and channels (potential as well as actual), which vary in size from the obvious alimentary-canal, air-passages, and great blood vessels, down to the finest ramifications of the latter, the cavernous tissues (both macroscopic and microscopic), the serous cavities, and the intra-cellular channels. All these form one continuous labyrinthine system, through which we may trace the ingested food materials, the metabolic, secretory and excretory products. As long as these channels are patent throughout, and as long as these various substances (including the "breath of life") can flow freely through them, and the vital energy has a free play outwards, so long is the body in a state of health.

But as soon as there is a continued interference with the freedom of movement, even though it be merely an ebb and flow that is affected, in any part of the canalicular system, then a state of disease arises, culminating in histological anatomical changes. Hence, when we observe a case of illness, we may be sure there is some "obstruction" in some channels in some part of the body—not necessarily in that where the symptoms occur.

E.g.: The nasal discharge of "cold in the head," the bronchial expectoration in bronchitis, the serous effusion into the pleura, the respiratory phenomena in an attack of asthma, are manifestations in the respiratory system of obstructions elsewhere.

§ 274. The next addition to the picture of the sick person's state is furnished by *the causes* of the obstruction. Avicenna considered these under two groups, the " material " (i.e. those in which " matter " is concerned) or " humoral diseases," and the non-material. To the latter group would belong cases of gross obstruction, such as by compression from without, or such as by obstruction with calculi ; and those in which there is a functional disorder—hypo-function, hyper-function, dysfunction. For instance, in renal disease, the loss of functional capacity may render the normal ebb and flow of substances disorderly.[141]

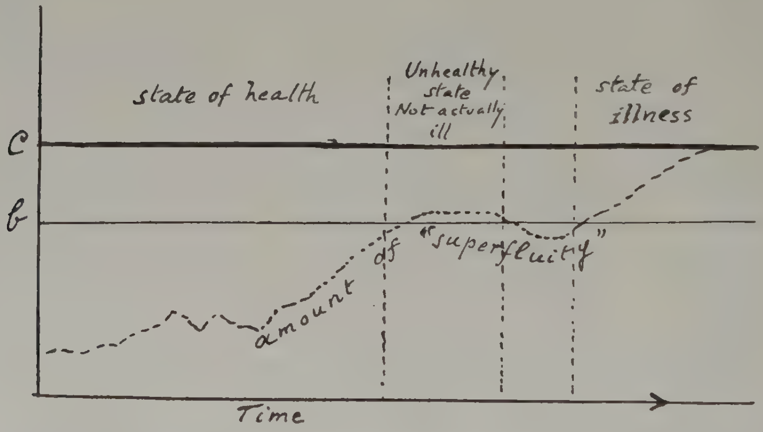
§ 275. The group of humoral diseases is predominant in Avicenna's pathology, and if we bear in mind what the " humours " really are, this position becomes quite reasonable. Perverted metabolism is associated with changes of physical state in the fluids of the body. Limpid fluids may become viscid, viscous substances may become mobile or " tenuous." In the ancient work, these chemical changes were thought of, not in " equations," but under interchanges between the imponderable elements ; as being subject to the laws of urooj, nasool, jelal, jemal, qaḍā, qaḍr, the rhythm, phases and rate of movement of the " breath " ; and the fluctuations of degree of innate heat. Concrete examples are such as : precipitation of urates in tissues, altered reaction of tissue-juices in rheumatoid arthritis, cardio-renal disease, tuberculosis ; variations of content of Ca, Na, Mg, etc., in the tissue-water, so that the flow from tissue to blood and vice versa is impeded. (Cf. Bechold, [112]*a*, Schade,[137]*a*, Pearson and Wyllie,[160] and many other authorities).

The Canon often insists on the presence of " superfluities " as a cause of " obstructions " of the canalicular system—not only in the tangible four humours, but also in regard to the " Breath " (" fuliginous superfluities," **238**). In the latter case, the substance of the breath (i.e. water-vapour) ceases to be " bright," and " clear," and its odour becomes offensive, and its freedom of flow is impaired.

§ 276. Finally, adding from modern knowledge, there are the changes in the fluids of the body produced by bacterial or putrefactive breakdown, whether this begins in intestinal stasis, or arises in the course of specific bacterial infections. There are then obstructions not only in the old sense, but in the form of the successive histological lesions consequent—vascular, nutritional, and inflammatory. Materials are deposited more or less permanently (irreversible reactions), as e.g. solid oedema, collagenous tissue, scar-formation, fibrosis and hyalo-fibrosis, adipose tissue, hyperplastic formations. Loss of anatomical patency is superadded to loss of functional perviousness.

§ 277. Clearly, whereas we give first place to the bacterial invasion, Avicenna gave it to the habits of life. He was so deeply impressed by the obvious fact that the quality of food determines the kind of chyme, that the kind of chyme determines the quality and amount of the four humours, **106**, **360**, **791**, § 195 (3). The quality and amount of humours determine the quality and quantity of the waste effete products (i.e. the superfluities). These affect the freedom of flow through the diffuse canalicular system of the body. As they accumulate in the stagnating tissue-juices they come to exercise a noxious action; they come to be beyond the capacity of the third and fourth digestions (tissue-digestion), and with their stagnation the ever-circulating bacteria (taken up with the food) also settle and multiply and wandering-cell infiltrations gather together. The beginnings of disease are laid down. The functional disturbance has been succeeded by anatomical lesions (**222, 226**).

§ 278. The following chart illustrates this notion of the nature of the state of disease. The amount of disease-substance or "superfluity" is plotted out, say from day to day, and shows an irregular line. As long as this line does not reach higher than a certain level, say *b*, the person appears to be in perfect health. If the accumulation of morbid matter, with associated "obstruction," is at a higher level, but below the heavy line *c*, he may feel ill, but has no definite lesions. If the superfluity curve reaches above *c*, there is some lesion which can be definitely diagnosed. There is a concrete diseased state. The height of the curve, and its nearness to the danger level, *b*, can be determined by the use of reasoning, aided by the various "indications."



§ 279. Finally, Avicenna enlarges his view of humoral disease by noting the influence of many extracorporeal factors (**234**, sqq.) as well as the period of life, not to mention the "decree of Allah" (**61**). Thus, one and the same kind of food taken at the "warm" period of life in the "warm" season may contribute more to the formation of a given humour than at another.

If we knew the patient's formulæ, and how the climatic and other conditions are likely to affect it, and whether they are compatible or not with susceptibility to the agents at work, our composite picture of the patient's state would be of great value, and illnesses often inexplicable would lose their mystery. How much more efficient might not the treatment be, if the remedial measures in contemplation were selected to harmonize with them?

No doubt only a fanatic would note the barometer, thermometer, humidity, hours of sunshine, wind-direction and velocity, the character of previous seasons, the clues afforded by the migrations of insects, rodents, and birds, the presence or prevalence of certain parasites in a district, and the many other points noted in **191** to **451**, before prescribing the regimen for the patient. But it would seem that some Eastern physicians of bygone times conscientiously strove to learn from such factors.

III

The Guides to the Diagnosis of the State of the Patient

§ 280. The patient before us is as a manuscript written in some highly complex language which it is our business to decipher. The alphabet is furnished by the several colours, the simple observations of size, shape, consistence, contour, texture, and the like. The vocabulary consists of the external features both in repose and animation, and of the physical signs as taught to-day. The grammar lies in the " general guides " (sphygmology, urinoscopy, examination of faeces and blood). The language is to be translated into : states of natural (vegetative), sensitive, and emotional faculties, functional capacities, plethora, obstructions, solutions of continuity, etc.—that is, the state of the whole composite, in all aspects. This task can only be accomplished imperfectly at the best, even by the most skilled and most learned. Our silent teachers, or guides, the " indications " (" dalīl ") always enable us to ascertain something, and we must perforce be content with that on the present occasion and be determined to use this experience as the guide to better success on the next.

§ 281. One of the guides suggested in the Canon lies in one's own state of health. Properly to interpret what we observe, we must ourselves have no disharmony of functions arising from errors of diet, no deposit in the urine, no weight in the bowels, no obstructions in our own brain, no mental fatigue, no emotional pre-occupation, no rigid notions regarding etiology or prognosis ; there must be clear channels for the breath, and the breath must be under the control of the will ; it must be kept pure by recollection, by devotion, and observance of prayer. The reason for this is that under such conditions, long persevered in, we are enabled to receive an " impression " from the patient ; we become aware of his atmosphere, aura, or personality in the form of an idea of his degree and kind of vitality. But unless this impression is registered rapidly, namely at the first approach of the patient, it will be confused and illegible by reason of the mutual inter-impression of one's own vitality with his. In another idiom, we observe " with the eye of a Taoist." In our own idiom, we make use of sound reasoning power, common sense, and a certain kind of " intuition," or " clinical sense."

§ 282. The guides furnished by general observation of the patient are, in brief : (I) External *features in repose* : (*a*) Colours : of face, hair, skin, eye (sclerae, iris). (*b*) Odours and savours. (*c*) Form of the body (i) as a whole ; (ii) in detail.—The features, the hands, the limbs ; the relative proportions (length, breadth, and thickness) of nose, cheeks, upper lip, lower lip, chin, mouth, ears, orbit, eyebrows.

forehead, etc.; the character of the neck, shoulders, etc.* (II) *Features when animated*: (*a*) *Expression*: gaze, look, facial gestures (vivacity, sleepiness; languidness) (*b*) *Deportment*, or attitude (**455**): gestures, carriage, specific acts or mannerisms, definitely morbid movements or defective movements. (*c*) *Voice*: tone of voice, manner of speech (clear, loud, or the opposites); clues to the physical and mental type, and the degree of energy and vitality. (The observation of the voice simply in relation to the diagnosis of aneurysm is quite insufficient.)

§ 283. The "general" guides. Our use of these differs noticeably, from that revealed in the Canon. To follow Avicenna, (i) when one places the hand on *the pulse*, one absorbs oneself in it, without the distraction of a watch, until one has found out how it runs—minute after minute. Even if it misses, without an intermission of the heart, because the patient gives a twitch of the finger or begins to talk, one learns even from that. The study of the circulation is more than the study of the heart's action. (ii) When one examines *the urine*, even with all the apparatus of modern chemistry, we must remember that it is first and foremost the guide to the state of digestion—especially its "second stage" (that in the liver) as well as in the "third" stage (that in the small vessels). We are misled by the search for albuminuria and glycosuria, for many would make these abnormalities into diseases. Thus, the number of persons in whom albuminuria is *not* evidence of renal disease far outnumber those in which it is; the presence of such a substance in the urine should lead to the questions: is some substance not being dealt with? if so, why? can only the kidney handle it? To follow a useful rule, the real trouble is remote. It may lie in the brain, in the emotional state (cf. Graves' disease, e.g.). Pentosuria, cystinuria, alkaptonuria also break the current ideas about urinalysis.[162] (iii) As regards the guide furnished by *the faecal matter*, again, our knowledge is much greater than was Avicenna's and we do not apply it in his terms. We are apt to lose ourselves in fat analyses, nitrogen estimations, occult blood tests, B. coli classifications. Negative results in each case are taken to mean "nothing of note," regardless of the continual secretory and excretory changes proceeding in the intestinal mucosa, and the vitality of nerve-ganglia, etc. Essential and definite derangements may occur without conspicuous deviations from the restricted standards usually laid down.

§ 284. The guide furnished by an examination of *the blood* may be spoken of as the most notable modern addition to Avicenna's three general guides. The data obtained from it—physical, physicochemical, cytological, serological—are very numerous, but are lost more often than not by restriction to the diagnosis of the various

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* Space does not allow of any attempt to furnish precise details of the external signs of functional capacity of internal organs. The principle is exemplified thus: the lower part of the nose is part of the respiratory system, and shares in the degree of development of the whole system; therefore wide nostrils with well-formed alæ go with good development of the whole respiratory function, whereas narrow delicate nostrils and small alæ refer the observer to some other system as well-developed. Large mouth, thick lips, large masseters, and generally well-developed lower part of the face go with good development of the digestive tract throughout. Moreover, development or capacity above the average in one system denotes relative weakness and functional deficiency in another system.—The subject is extensive.[138]

" blood-diseases." When properly applied, all the data obtained from the blood inform us of the functional state of all the organs, and of the existence of the main groups of pathological state (§ 173).

IV

Treatment

> " The healing art, as it is described in books, is far inferior to the practical experience of a skilful and thoughtful physician."(Rhazes.)
>
> " He went forth and hired himself a house in the city for the better storage of his books and scrolls, his medicines and his aromatic roots. Then he set to work choosing the fittest drugs and simples." Night 49. (Burton.)
>
> " Many are healed by the action of nature without the art of medicine." (Summa contra Gent.[82] ii. 75, p. 204.) " Man teaches by outward ministration, but God by inward operation : even so the physician is said *to minister to nature* when he heals."(ib. p. 205.)

§ 285. Application of the principles of the Canon to modern practice would seem superfluous. The common ailments, especially those of minor surgery, are nowadays treated in stereotyped fashion, which appears to be beyond improvement. It is not with such cases that reference to the Canon is suggested. It is the general principle which may be reviewed in the mind, and lines of treatment such as were once in vogue may be quite usefully applicable in a few cases which do not well respond to modern methods. Moreover, the conscience of even the most careful may not be altogether clear in regard to the immemorial rule : " tuto, cito, et *jucunde*."

The subject may be briefly considered under two headings : plan of treatment ; methods of treatment.

(1) *The plan of treatment*

§ 286. Choice of a plan of treatment depends on the view which is taken as to the cause of the illness. It is no new or modern thing to say " treat the cause." The distinction between new and old is in regard to the idea of the nature of the cause. In these days nearly every illness is ultimately due to an infection or intoxication, and the aim of treatment is to destroy the one and render the other innocuous. To Avicenna, illness was primarily an abnormal state of condition, to which many factors contributed, and the scheme of treatment must therefore envisage them all. To facilitate this, the practitioner of those days would advisedly mentally review the whole of the Second Part (**191-451**).

§ 287. Indeed, if we scrutinize the subject more closely, it will appear that Avicenna's plan is after all very proper. For, even if we could attack the microbic cause specifically, there would still remain the lesions which it has produced, and the lowering of the vitality (= interferences with the flow of vital currents, in Paracelsus' idiom[29]). A *condition* remains to be combated ; the condition is uppermost as far as the patient is concerned. Even in those relatively few cases in which the disease is bound up with a particular organ, so that the name of the disease is according (e.g. gastric ulcer, cerebral hæmorrhage), it is the condition we have to face. The cause, even when known, has done its work, and gone.

§ 288. It is true that many other interpretations of disease and corresponding plans of treatment are put forward in various quarters from time to time, especially by the intellectually anarchistic. This occurrence is partly the outcome of the arbitrary attitudes towards patient and friends sometimes exhibited by some of the representatives of academic medicine and would be best met by frank and courteous enquiry into lay opinions. Not everyone subscribes to the restrictions of medical ethics, and the patient is too often treated as if illness *ipso facto* at once deprives him of ordinary intelligence. After all, he seeks medical help for a distinct object, and remuneration for the services is presumed, so that he is entitled to go elsewhere, at his own choice, if unfortunately in his particular case the plan and method of treatment proves unsuccessful. But this view is not subscribed to by those who assume that the whole of the knowledge needed for every case is comprehended within the orthodox teaching of the day, and that every individual possesses it.

(2) *The methods of treatment*

§ 289. Even the methods of treatment set forth in the Canon are still resorted to at times. No doubt, we would do well to follow them more frequently. Thus, *systematic purgation* is often called for, but not carried out as radically as of old. *Cupping* is still of value for such conditions as lumbar myositis, acute (hæmorrhagic) nephritis, and those diseases amenable to autohæmolysins. *Venesection* is sometimes effectively applied for cases of high blood-pressure, threatened apoplexy ; it is incidentally used in the course of obtaining blood-tests.

Theophrastus
Dioscorides

§ 290. *Drug Treatment.*—The steady decline of drug treatment in modern medical practice is evidenced in several directions. (*a*) The steady removal, in successive editions of the British Pharmacopœia of herbal remedies which are supposed to have no action because laboratory animals appear to be unaffected by them. (*b*) The infrequency with which medicines are ordered for hospital patients. (*c*) The penalization of panel practitioners for " over-prescribing." (*d*) The desire on the part of many lay persons to banish " drugs " as being " unnatural."

Inconsistencies are frequent. There is the strange perversity which (through legislation) denies facilities for the use of the few drugs whose potency is quite unquestionable. There is the subterfuge of resorting to placebos (which often cost no more than the bottle containing them). Those among the lay who decry drugs are pleased to employ " herbal " remedies. Where there is a popular demand for the latest remedies, this is met by a never-ending stream of new synthetic and other preparations, and costly manufactured products, which also the medical world submits to. Truly the mind ever seeks in the relatively inaccessible, and the expensive, that which lies all the time, and without price, at our feet. It describes as "progress" that which better knowledge would render superfluous.

§ 291. The truth is that we know far too little about the herbal remedies of the Canon. To begin with, we forget that they cannot be efficient without careful attention to the conditions of their cultivation (soil, climate, season, etc.), the times proper for their collection, the details of their preservation, and the laws governing the formation and circulation of the active principles during the life-cycles of the various plants. We do not individually know how to identify adulterations, whether accidental or deliberate. We leave to wholesale manufacture that which was once properly undertaken individually, since personal artistic skill may be the real condition for pharmacological efficiency. We adopt the short cut of standardization of drugs as the remedy for the loss of potency inevitable after neglect of such various factors.—But even if the purity and potency of remedies be granted, by recourse to the best sources, they must be employed with deliberate care. As Avicenna shows in the second book of the Canon, there must be a knowledge of the constitution or individuality of the plants which yield the drug; harmony with the constitution of the patient must be aimed at. Out of a number of drugs of like action, some will accord better with one person's constitution than with another's. One remedy may soothe and ease without its specific action being at all diminished, whereas another performs its work harshly and unpleasantly; another may be overpowered by the personal factor. The scope of the subject is great, and its study, with intent to serious practical application, should not require an "apologia."

§ 292.—Such considerations as these open the door of Romance. The discovery that all Nature is a living Whole, always at work, earnestly, steadily, continuously developing an *idea*, would arouse a new and intensely absorbing interest—that of watching the Unseen Worker; though His hands are not to be discerned, that which He does is ever proceeding before us as a continual motion-picture; and we may become aware not only of the merely superficial fact of the movements, but also of the *purpose* unfolding. Watching the medicinal trees and shrubs and herbs in this way, and seeing their properties by their forms, and colours and odours, and their changes in character with the changes of the seasons, and alternations of drought and plenty (variations of rate of growth, of activity of flowering and fruiting),—how great is the wonder of the work of Nature! We note how substances are being elaborated into plants which we, wanting their help, know how to take at the crucial moment—"now we must draw the resin; now we must take these flowering tops," and so on. But we are not the only watchers. The bees have been waiting, and the birds, the slugs, the ants, the herbivora—all these and many others wait to draw from such supplies that which is applicable to their several requirements. Nature Herself also waits for all these things to be collected from Her treasury. Everything has been worked out; the interactions are arranged for; they all belong to the purpose of the Designer; and He Himself is waiting for that over which He incessantly broods, with entire and complete intention. He too waits to draw out of Creation that which was His object in making it!

§ 293. No doubt it is true that few of the ancient physicians entered fully into this inner life of the world of which they formed a part. Few even of those who learnt the Qanun by heart may have applied it effectively at all times and on all occasions; few may have meditated sufficiently to consider the soul-life of the patient they were called upon to help. But the Life was there then, as it is here now. It could be read then, as it should be now. The entry to the infinite treasure-house of Nature was not locked then, and it is not locked now. Indeed, the entry was not merely through one door; there was a portal of entry on every side. Doors so large as to be discernible from afar; doors so small that few could find them; but even through the smallest there was the same ability to enter the treasure-hall. Travellers in those days might fear imagined ogres, jinn, and terrifying guardians to counter talismans; but the keys of safety were everywhere to hand, for all these beings were amenable to caresses—the caresses of a heart which approached them with reverence and affection; asking questions but never injuring; always treating everything within the treasury (for it is living) as gently as one should approach to watch a sleeping babe.

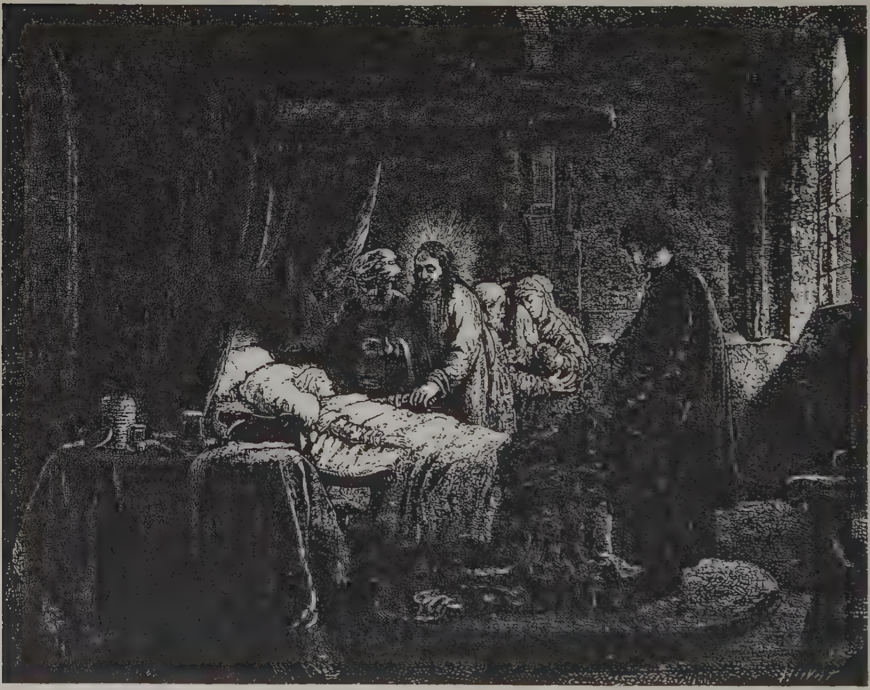
§ 294. It is for us ourselves not to pass these things by. If we did nothing more than study the materia medica of those days to see what products were available, we should have ample material for thought, and become cognisant of the links between that age and this. The drugs are still cultivated, and still used in the East in the manner of the past, and the history of their names adds to our understanding of their uses. While it is true we can supply our needs through an order to the apothecary based on information imparted to us through various intermediaries, we may some day find that in doing so we have omitted to look inside the treasure-house. To go back to the old paths, watching Nature and studying the uses of the living plants, is not to lose the definite therapeutic effects we seek. Far from it; and there is the added insight into that universal Life which needs transference from the inexhaustible abundance of Nature at large into the thirsting lack of the patient in particular.—It would then be not simply as a "relaxation" from the exacting labours of the city that one would go abroad into the country-side. It would be for the purpose of retiring to watch, and meditate upon the manifestations of the quiet persistent surging life of creatures below the level of man, thereby to learn something of the secret through which the equilibrium of health is to be restored to the needy and also oneself to receive from the fountains of life.

§ 295. *Dietetic treatment.*—In these days, this form of treatment is increasingly to the fore. But whereas modern thought is in terms of food-values and the like, the Canon insists (and rightly) on the necessity for studying physiological and psychological incompatibilities in regard to each component of the diet, and for selecting the various articles of food according to their constitution, so that they shall be in harmony with the constitution of the patient.

§ 296. *Regiminal treatment.*—The term "regimen" has a wide range. This has already been sufficiently indicated at the end of Part III (§ 254). The consideration of the specific constitution of the patient, of his present state, and of the conditions which are likely to arise during the various successive phases of his illness, must pervade every detail of the prescription of the regimen, to ensure that the correspondences between the state and the various measures adopted shall throughout be as harmonious as possible.

§ 297. In this way, the great importance of individual artistry in treatment is constantly insisted on, by contrast with the prevalent stereotyping of therapeutic methods, whether in regard to State-regulated practice in its various branches, or in the provision of medical relief on a wholesale scale, or in the efforts to subject as much as possible to the output of team-work. The atmosphere thus created helps the student to realize that the last word has not been said when the clinician's discourse over the hospital bed is ended, and the protocols, and therapeutic orders have been set upon the bedsheet.

§ 298. The following may be quoted here, from Bauer[161]: "It is true, there *is* a difference between the pure medical science and the art of its practical application at the patient's bedside. This art is somewhat more, indeed, than this application; it requires more than a complete knowledge of all scientific details; it is and will be



After Rembrandt.] [Photo by Elliott & Fry.

To face page 567

always an art which never will be transformed into an exact science, as the complete understanding of one person's psychophysical machinery never will permit us to understand a second man's personality just as well by a pure analogy, because of the practically infinite variability of the individual constitution. The individual analysis must start always anew, and what science of the human constitution may help, is only to establish certain groups of more or less pronounced common characteristics . . . it will never replace entirely the doctor's art to . . . take the individual particularities of his patient into consideration . . . in constructing his diagnosis and in applying the fitted treatment."

§ 299. The *clinical handling* of a case is guided from time to time by the experience which has been concentrated into aphorisms. Like many ancient medical works, the Canon abounds in these also, and some of them will no doubt be found among the modern collections of aphorisms which are available. In this way, too, it may be true to say that the conduct of a modern case sometimes receives the personal guidance of the wisdom of the past.

§ 300. But the time has come to close the ancient book. As we do so, we are conscious that our range of vision is widened, and our sense of responsibility deepened. We may pass back to labour along the sick, seeing things anew in the light thrown upon them by the company of the great Persian Sage, better aware of our own shortcomings, and more convinced that we are ourselves individually to gain our own discernment into the intimate state of the people with whom we must deal. We face more confidently the exceptions to academic lore which are so much commoner than the rule.

Deeper insight into the nature of man, and the wider outlook
of a true philosophy does away with notions of superiority of new
over old, making clear, as it does, the necessity for combin-
ing and welding the two into one corporate whole.
But over and above all this, this ancient work
reminds us that the change of state of the
patient from illness to health is always
ultimately among the counsels of the
Divine Physician, who alone
overrules our ideas of cause
and effect, when He
utters the words—
"I say unto thee,
'Arise'."

APPENDIX

1. PROGRESS

PROGRESS is a relative term. The common error is to assume that it is an end in itself. Things which can be described as " up to date," or cast aside as " out of date," do not belong to the real basis of human life. The idea of progress is associated with the introduction of mechanical improvements of all kinds ; with mass production of manufactured articles ; with the standardization of existence. In the domain of medicine, it is more particularly associated with an increasing knowledge of concrete facts, with specific discoveries in etiology and treatment, and with a new nomenclature.

To illustrate the relative character of " progress " one may call to mind that many discoveries and inventions are simply actualizations of ideas previously current among thinkers, but perhaps not noticed at the time, or even repudiated or attacked as heretical. Further, as to the changes in nomenclature which occur as time goes on : because our language and idiom is different, many are apt to think the old statements were necessarily incorrect.—In mediæval books dealing with materia medica, they said for instance : " dissolved in vinegar, the action is so-and-so," whereas we say simply : " acetum—, action and uses : . . . "—In chemistry, they might say " fire produces *yz*," whereas we say " on heating *Z*, the result is *Y* and *X*."—In medical text-books there are innumerable diseases which are not mentioned in old works ; and some diseases of the old books do not appear in modern ones. This is partly explained by the undoubted fact that we have diseases which once did not exist, whereas other conditions, very common in those days, certainly never occur now.—The methods of teaching are different. In these days we convey information much more quickly and readily by diagrams, charts, tables, styles of print, not to mention experiments, and moving-pictures. This fact does not prove that the learning of those days, acquired so laboriously, was faulty.

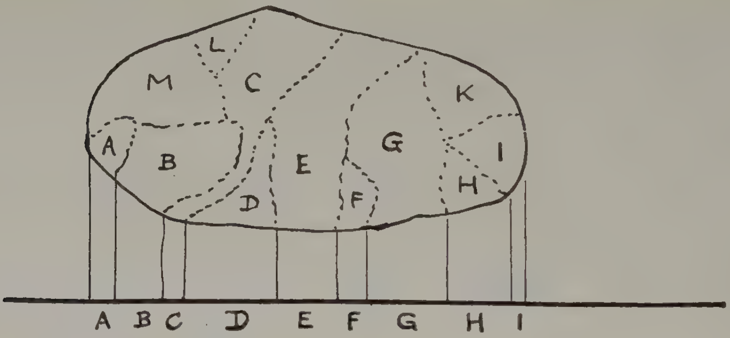
That which is called " progress " is also sometimes merely " fashion." The search for an elixir of life, for instance, has not ceased in the least. The gland therapy for restoring youth is perhaps the most conspicuous of modern variants of ancient research. Cupping and venesection were habitually used solely with the idea of " keeping fit " ; they have given place to the vogue of athletics and sport.—New treatments for various conditions are introduced from time to time, and seem to be great advances because they are often conspicuously successful at first. How often do they not give place to still newer methods, and perhaps finally pass into entire oblivion ? The fashion changes, and the old is supplanted.

2. FACTS—KNOWLEDGE—TRUTH

It is suggested in § 11 that knowledge is not simply " acquaintance with an assemblage of facts " ; and that facts in the aggregate do not suffice to constitute " truth." There is a tendency to extol the acquisition of facts, as " adding to the sum of knowledge," and as being evidence of " progress." There are different forms of knowledge : human, angelic, divine. The perfection of knowledge is wisdom. There are different forms of truth : scientific, logical, moral, ontological, philosophical, theological, etc. But as to " Ultimate Truth," this is humanly unattainable, as may be illustrated by the accompanying diagram.

The observer and the thing observed are shown in plan, as being separated by a straight semi-transparent screen. The letters A to I represent the position of as many observers. For the purpose of illustration these are supposed to be of different nationalities and not necessarily acquainted with one another's language; they also belong to different periods of life (childhood, youth, etc.). The observer at A may be supposed only to be able to see the part of the object marked A; the observer at B, similarly, may only be able to see the part marked B; and so on. But even if any of the observers could see several parts, evidently there still remain some areas which are out of the range of vision of all persons, as marked K. L, M. No one can comprehend the whole, under the restrictions given. (Cf. § 293.)

This conception may be applied to the interpretation of terms applied even to familiar objects. In studying the Canon, for instance, it is not enough to know the dictionary equivalent of an Arabic or Latin word, for the full meaning is not always adequately conveyed thereby. The word "Akhlāṭ" may be taken as an example. It is rendered humor, humour, body-fluid, juice (cf. ruṭūbat), Saft. The impression conveyed by each equivalent varies according to ideas commonly associated with the word and the circumstances under which we first heard it. The conception of the word "humour" was necessarily different in the mind of the ancient Greek physician, of the Hindu sage, of the erudite philosophical Chinese, of the alchemist of the Middle Ages, of the characters in Shakespeare, of the modern laity, of the student of esotericism, and of the modern bio-chemist. But even if we could combine all these conceptions, there must remain the K, L, and M necessary for a complete understanding.



It has been said that we shall reach Truth by whatever road we take. But this is not so. There is really only one path which will take us there direct. All the others are devious and arduous, and in the end only bring us to the confines of Truth. We may trace out every separate road as outlined for us by as many separate thinkers of the past or present; we may pursue the highway which modern science has opened out; we may decide also to study the tracks with which we are furnished by Nature Herself. But even after all these have been slowly and laboriously surveyed by (spiritual) insight (Kashf), the best we can attain is but the fringe of Reality.

The irregular figure in the diagram, which serves to stand for "Truth" may also be thought of as the plan of a palace with many halls and courts. We may enter it through various portals, marked A to I, and we may leave it again to resume our ordinary duties. At some other time, on returning to the study of the contents of the various chambers, we may chance to find our way into some of the veiled portions (marked K. L. M), and perhaps gain a passing glimpse of what is beyond. Whereupon we shall not only rejoice in the enchantment of those unexpected revelations, but we shall see the world around us with new eyes. For this world is the palace. Through the visible things of this world we reach the invisible; and through the invisible things we dimly discern the Life which is our ultimate goal.

"The face of all the world is changed . . .
Since first I heard the footsteps of Thy Soul."

3. The Materia Medica of the Canon

The following list gives those of the Simples discussed in the Second Book of the Canon which are still in use. Those marked with an asterisk are Pharmacopeial; many of the others are found in the Catalogue of Messrs. Heath & Heather, Ltd. (St. Albans).

A. Acacia gummi,* aconiti radix,* acorn, adeps,* agrimony, amygdala,* aloe,* alumen* (native), (ambergris), ammoniacum,* amylum* (from rice), anethi fructus et oleum,* anisi fructus et oleum,* antimonium,* anthemidis flores et oleum,* armenian bole, asafetida,* ash-tree, asphalt.

B. Barberry bark, banana, barley, bay-tree and berries, beech-tree (bark), beeswax (cera*), betony, bile (fel bovinum*), bistort (black hellebore), bone-marrow, borax* (impure), bran, brown sugar, brooklime, white bryony root, black bryony root, bugloss, buttermilk.

C. Calamint, calamus, calx,* calcii hydras,* chamomile, camphor,* cane-sugar, cannabis indica,* cantharides,* capsici fructus,* carui fructus et oleum,* cardamomi semina,* carrot, cascara, cassiae fructus,* castor oil,* catechu,* cayenne pepper, chirata,*, chicory, cinchonae rubrae cortex,* cinnamoni cortex et oleum,* cloves and oil,* cochlearia armoracia, cocoanut, colchici cormus et semina,* colocynthidis pulpa,* colophonium ("resina,"*), conii folia, convolvulus turpethum,* copper and copper sulphate (impure), coral, coriandri fructus et oleum,* cotton (gossypium,* and gossypii radicis cortex*), couch-grass (triticum), creasotum,* croton oil,* cubebae fructus et oleum,* cucurbita semina praep* (cyperus rotundus, cypress-turpentine tree fruit).

D. Dates, dried and fresh; dragon's blood.

E. Egg-plant, elecampane, elaterium, embelia.*

F. Foeniculi fructus; ferrum*; filix mas*; fuller's earth.

G. Galls, garlic, gelatinum,* gentianae radix,* germander ginger,* glycyrrhizae radix,* gold, grapes (unripe), green vitriol, groundpine, gum tragacanth.

H. Hartstongue fern, hellebore, hemlock,* hyoscyami folia,* honey, humulus lupulus flowers,* horehound, hydrargyrum.*

I. Iron-rust, isinglass, ivy.

J. Jalapa,* jalapae resina,* juniper berries, and oil.*

K. Kaolin.*

L. Lard (=adeps*), lavender, lead carbonate and oxide, lemon, lime ("calx") linseed and oil (long pepper, lote tree, lupin).

M. Mace, maidenhair, marsh mallow, mandrake root, manna, marjoram, meadow-sweet, mercury (=hydrargyrum*), mistletoe, mouse-ear, mugwort, myrobalanum,* myrrh.*

N. Naphtha, nigella, nitre, nutmeg,* nux vomica* (or, wintercherry ?).

O. Oakbark, olive oil,* opium,* orange-peel,* orangeflower water,* orpiment, oxymel*; many essential oils.

P. Parsley, pearl barley, pearlashes, pellitory root, pennyroyal, pepper (confectio piperis*), pepper-mint oil,* pepsin (tripe), pine resin ("resina,"*), pix liquida,* polygonum root, pomegranate bark, poppy (white), black poplar bark, red poppy petals (rhoeados petala*), Pterocarpi lignum,* pyrethri radix.*

Q. Quicklime (= calx), quillaiae cortex.*

R. Rapeseed, rhubarb rhizome,* rice, rosemary, rue.

S. Saffron flowers, sage, sal ammoniac (crude), santoninum,* scammony root and gum,* sealingwax, seaweed, sennae folia et fructus,* sesame oil,* sevum praeparatum,* silver, soapwort, sodium chloride,* sorrel, southernwood, spearmint (ol. menth, virid.*), sponge, stavesacre seeds,* styrax praeparatus,* stramonii folia,* sulphur,* sunbul.

T. Talc, tamarindus,* taraxaci radix,* thyme, tin, tragacanth,* truffle, tumeric, turpethum.*

V. Valerianae rhizoma,* verbascum, verdigris (copper acetate), vervain, viola odorifera.

W. Walnut, water-cress, white water-lily root, wax, whey, white lead, willow bark, wormwood (= absinth).

Z. Zinci oxidum* (but impure); zingiber.*

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This masterly work, to hand in November, 1929, contains considerable sections on the Pulse (pp. 157-193, 198-210). The following lines in the Preface find assent in the pages of the present treatise : " The real greatness of Chinese Medicine lies in its endeavour to unify the human microcosm and its disorders and diseases with the macrocosm, the heavenly Tao. Even though the edifice so reared is really largely a castle in the air, the basic idea itself is grand and infrangible."

INDEX

A study of this index furnishes the best idea of the range of subjects discussed in the First Book of the Canon.

The numbers refer to the paragraphs in the text. Heavy figures show that the subject is dealt with in the text of the Canon; italic figures refer to the paragraphs of the interspersed Treatise, commentary, and notes.

A

Abdominal inflammatory masses, treatment of, **1055**
Ablution with cold water, **757**; after exercises, **758**, *244*
Abnormal forms of atrabilious humour, **90**; of serous humour, **74**
Abnormal movements, causes of, **427**
Abnormality of blood, its source, **72**
Abnormal sediments in urine, **658** (1-10)
Abscess: effect on pulse, **600**
Abscess explained, **209**
Abscess of liver, urine in, **636**
Abundance of hair at puberty, meaning of, **475**
Accessory function of lymph, **73**, **106**; of bile, **82**
Accidental causes of disease, examples of, **232**
Accidental change, *67*
Accidents, definition of, *60*
Acid serous humour, two forms of, **79**
Aconite, action of, **350**, **354**, **356 B**
Action and passion, *89*
Active and passive qualities, *102*
Active principle of food, **349**
Activity of cyclical changes in the breath, explained, *138*
Acute inflammatory swellings, treatment of, **1049**
Adenoids, **723**
Adiposity; see obesity. Hot baths after meals, for, **406**
Adolescence, **51**; urine in, **670**
Adrenalin and its mode of entry into the blood, *122*
Adulteration of urine with saffron, **625**
Adult life, urine in, **670**
Aerated water, action of, **391**; utility of, *408*
Aeration of breath, **238**
Affectionate disposition, and water element, *78*
Affusion, **757**, **758**
After-taste of purgative, how to remove, **983**
After-treatment, after leeching, **1042**; after venesection, **1027**, h
Age and pulse, **575–578**; *234*
Aged persons, diet of, **786**
Age of patient a guide to evacuant treatment, **934** (6)
Age of wet-nurse's babe, **707**
Age, variation of urine according to, **670**
Agents, alleviating pain, **435**; altering the qualities of the body, **415–430**; causing deformity, **419**; causing obstruction of channels, **420**; opening up channels, **421**; producing hardness of the body, **422**; producing displacements and luxations, **424**; preventing apposition, **425**; preventing expansion, **426**
Ailment, definition of term, *168 A*
Air, see atmosphere

Air, changes of, are dual, **308** ; contamination with stagnant water, etc., **276** ; definition of, **23**, **309** ; infections, to avoid, **877** ; its moisture and dryness defined, **250** ; not ' breath,' **234** ; properties of, **23** ; putrefaction in, **275** ; versus ' atmosphere,' **309**
Alhambra, secret of, *5*
Alien heat, **73** (see Foreign heat)
Aliment, two functions of, **925**
Alleviation of pain, agents for, **435**
Al Najat referred to, *14*
Alterative faculty, **149**
Altitude and climate, **307B**
Alum in water, effect of, **384**
Aluminous and bitter waters, antidote for, **899** ; diseases benefited by bathing in, **408** ; how to purify for drinking, **876**
Ammonia salts in drinking water, effect of, **384**
Anabolism and katabolism, *142*
Anæmia, treatment of, **845**
Anæsthetics, **814** ; Burton's note, *ib.*
Analgesics, **435**
Analogy between changes of breath and events of Chinese history, *133* ; between the four elements and the vibration-rate, *77*
Analysis of terms applied to living beings (table), *128*
Anatomy as the expression of strengths and weaknesses, *126* ; necessary to diagnosis, **456**, **461** ; proper purpose of, **456** ; three-fold value of knowledge of, **912**
Anatomical relations, **911** ; structure, cause of variation, *119*
Ancient and modern medicine compared, *19*, sqq. ; *re* urinalysis, *239*
Ancient anatomy, key to object of, *118*
Ancient medicine may succeed when modern methods fail, *35* ; still practised, *35*
Aneurysm, signs of false, **513** (5)
Anger : and the fire element, *78*, *160* (4) ; and the atmosphere of a person, *ib.* ; is calefacient, **415** ; cause of outburst, *160* (4) ; effect on blood and breath, **1117** ; effect on pulse, **601** ; meaning of, **490** ; synonyms, *164* (II)
Anginas in autumn, **289** (i)
Anguish of love, **345** (footnote)
Animal breath a phase, *148* ; faculties, **174** ; animal faculties defined, *129* (5) ; prudence, **180**
Ankylosis, **199** (12)
Anorexia, diet in, **781**
Antecedent causes, **231**
Antigalactogogues, **706** ; anti-inebrients, **811** ; anti-inebrient syrup, **812**
Aperient foods, **785**, *254*
Aphorisms, use of, *299*
Aphthous stomatitis, **720**
Apoplexy commoner in winter, **294**
Appetite, and breath, *148* ; and waking state, **339** ; due to acridity of atrabilious humour, **185** ; fictitious, **761** ; kinds of, *159* ; of youth, why big, **57** ; rational, *159* ; stimulated by atrabilious humour, **88**, **106**
Appetites classified, *158*
Appetitive faculty, *159* (II)
Appliance for cauterising mucous membranes, **1072**
Application : of Canon in modern clinical diagnosis, *280* ; in modern treatment, *285*; in pathology, *273* ; of doctrine of elements, *78* ; to histology, *95* ; to climate, *180* ; to bio-chemistry, *90-94*
Application of study of interactions, *165* (IV)
Apprehensive faculty, **180** ; not very important for physician, **181** ; versus cogitative faculty, **180** ; versus imagination, **180**.
Aqueduct water, **375**
Arab drinks, see **800** ; fruits, *251* ; sherbets, **797**
Arabian civilisation in Middle Ages was of high order, *3* ; classification of faculties (diagram), *155* (II) ; meals, *251*
Arduous labour and evacuant measures, **934** (11)
Arefactive lassitude, **833**
Arguments as to innate heat during youth, **53** ; as to vital faculty being necessary to sensation, **163**
Arms, veins of, for venesection, **1022**
Aromatic drugs, mode of action, **1120**
Aromaticity and its importance to the heart, **1121**

Arhythm of pulse, **534** ; cause of, **573**
Arteries contain blood, **116** (6), **132**, *37* ; description of, **116** (6) ; function of, **116**
Articles of food which help emesis, **1003** ; which increase alvine discharge, *254* ; which purify the blood, *254*
Articulate language, versus "speech," *153*
Artificer and lawgiver, *100*
Ash of atrabilious humour, **92**
Asses' urine, **640**, **673**
Asthenia and rarefaction of skin, **839** (iii) ; cause of, **443**
Asthma, classification of causes, **444** ; in southerly countries, **329**
Astringents, intestinal, indications for, **990**
Astrology, *162* (i)
Atheroma, explanation of, *105*
Athletic age, regimen for, **736** ; quick pulse after, *227*
Atmosphere, personal, detection of, *281* ; explanation of, *141*
Atmosphere, kinds of, effect on body, **234** sqq., **313** ; in spring, **255**, **257** ; in winter, **256** ; natural changes, **242** sqq. ; preternatural changes, effects of, **308–313** ; varieties of, **241** ; and see "air"
Atmospheric changes, effect on human body, **312**, **313** ; regimen for, **873–877**
Atmospheric influences on body, operation of ; quoted from Ch'i Po, *181*
Atrabilious constitution, diet for, **766** ; description of, **85** ; dreams in, **500** ; foods which increase, *195* (3) ; in fæces, significance of, **675** ; predominant at end of summer, **288** ; relation to faculties, appetite, and aspect, **500** ; signs of dominance, **500** ; swellings, **212**
Atrophy, general, **199** (ii)
Attenuant, attenuate : the word is sometimes loosely used to describe a dilution of a thick or concentrated solution. A weak solution is 'attenuated.' Sometimes it is used to describe a change of consistence. It is a correct term for expressing a diminution in the degree of cohesion of the particles of a substance. In a "dense," or "thick" fluid, the particles are close together and more or less firmly coherent. An agent which interacts with such a fluid so as to render the particles less closely adherent, and therefore further apart, is "attenuant." The consistence alters accordingly, and the optical properties alter from opacity to more or less translucency. Such a process is one of "dispersal" (e.g., of an inflammatory mass), or "resolution." Cf. *275*.
Attenuated foods, **359** ; serous humour, description of, **760**
Attitude : of body reveals state of breath, *144* ; of a member reveals its state, whether healthy or not, **454** (5), **455**
Attraction, mechanism of, **156** ; analogous to female attraction, **146**
Attractive faculty, **147** ; achieved by longitudinal fibres, **185** ; co-operates with purgative principles, **965** ; not equal in all organs, *133*
Augmentative faculty, **143**
Aura, meaning of, *141*
Autochemotherapy in Chinese medicine, *36*
Autopsy is only a small fraction of "the case," *127*
Autumn and the pulse, **581** ; definition of, **242** ; diseases of, **289** ; effect on body, **287–291** ; effect on atmosphere, **247** ; regimen appropriate for, **875** ; why it predisposes to illness, **287**
Auxiliary members, **123**
Avicenna knew Indian medicine, *8* ; his medicine is based on a definite conception of human nature, *20* ; his terms for the three faculties, *129*
Ayurvedic philosophy, **20** ; sphygmology, *214*

B

Babyhood, definition of, **52** ; hygiene of, diseases of, etc., see "Infants"
Bad effects of hot bath, **407**
Balance : application of principle of, **30** ; application to character delineation, *165* (IV) ; between evacuation and retention constitutes health, **398** ; between organs, **72**
Bandaging, tight, **420** f., **416** (8) ; is dangerous, **204**
Basis : of occult powers in human constitution, *162* (vi) ; of terms applied to the three faculties, *129*
Bath attendant, his work, *198*
Bath-house, **75** (2), *244* ; characters of good, **400** ; described, *198*, *199* ; rest-room mural decorations, *199*

Bathing in relation to administration of enemas, **1014**; of purgation, **973**; for lassitude, **836**; in cases of ulceration, **1067**; in the spring, **757**, **281**; up to age of 13, **735**; in infancy, **694**

Baths as humectants, **417**; beneficial effects of, **756**; copper, **751**; effect of according to skin-state, **402**; effect of the different temperatures, **402**; effect of duration of, **405**; for cases of hot intemperament, **866**; for emaciation, **871**; forms of, **751**; full length, **751**; hot, effect of, on pulse, **596**; injurious effects of, **756**; in winter, object of, **432**; names of various kinds, **751**; natural action of, **401**; rules re cases of induration of skin, **839** (ii); rules re meals, **406**; sometimes warming, sometimes depressant, *198*; to make thin persons fat, **871**; when not needed, **751**

Bath treatment of hectic fever, **407**; warming effect of, explained, **403**

Bazaar life, a picture of the processes within the body, *100*, *239*

Beauty-culture, **872**, **897**; in the application to Truth, *89*; loss of, **221**; -sleep, **818**

Bedroom, choice of, for old age, **854**

Bile arouses desire for stool, **106**; cleanses bowel, **106**; diminishes surface tension, **82**, **106**; functions of, **82**, **106**; how secreted, *122*

Biliary passages, obstruction of, urine in, **621**

Bilious constitution and the hot season, **286**

Bilious humour: description of, **82**; effect on dreams, **500**; on rational and vegetative faculty, appetite, aspect, etc., **500**; foods which increase, *195* (3); in the fasting stomach, **780**; predominant in autumn, **288**; set moving by hot bath, **407**; signs that it is dominant, **500**; table of types, **84**

Bilious temperament,—and purgation, **980**; benefited by wine, **802**; diet for, **766**

Binder, rules about, **692**

Biochemical tests sometimes fallacious, *25*

Bitter serous humour, explanation of, **77**

Bituminous baths, effect of, **408**

Blankets, why more are necessary in sleep, **340**

Bleeding should be frequent if much flesh-meat is taken, **771**

Black chyme, **675** (3)

Black: kinds of, **615**; black stools, **675** (3); black urine, meaning of, **615**

Bleeding in cases of lassitude, **837**

Blepharitis in infants, **721**

Blood: in urine, meaning of, **612**; colour when atrabilious humour plentiful, **501**; foods which enrich, *195* (3); oiliness of, **468**; purpose of studying, *284*. See 'sanguineous humour'

Blood-forming centres: what they are, *121*, *147*

Blood-letting, see Venesection; also **1017**; in fevers, precautions concerning, **1029**; when preferable to purgation, **950**

Blood-states and emotions, **1117**

Blood-vessels the materialisation of the blood-stream, *123*

Blushing, a means of cure, **922**

Boating, **741**

Bodily exercise, general discourse, **736**

Bodily strength does not depend on quantity of blood, **97**

Body: and soul forms one single being, *25*; -fluids different from humours, *117*; not a make-up of spare parts, *23* (ii)

Boiling to purify water, **368**

Books—words—thoughts, *7*

Bone, **116**; very different from blood, **134**

Boundaries of the three kingdoms, *129* (1)

Brain, effect of wine on, **803**; inflammation of, **719**; not the *source* of activities, *25*; signs of functional adequacy, **453**; water on, **719**

Breakfast, Arab, *251*

Breath, *134*; aeration of, **238**; and emotions, *139*, *160* (4); and passions, **1093**; and pulse (in Chinese science), *209*; and syncope, **342**; application to histology, *146*; a luminous substance, **1091**; a ray of light, *ib.*; changes of quality, *138*; ditto, simultaneously with changes in composition, *148*; choked in cases of plethora, **442**; concentration and condensation of, **237**; confinement of, in emotions, **342**; confused, effect of, **1103**; course of through body, **171**; definitions of (positive and negative), *136*; depuration of, **236**; dispersed by hot bath, **407**; dispersed with humours, **111**; diverse theories about, **173**; effect of coarseness of, **1103**; effect of confusedness, in daily life, **1109**; effect on emotion varies according to amount, quality, and substance, **1103**; effect of poisons on, **356** B; effect of scantiness, **1103**; effect of sleep on, **337**; effect of strong emotional states on, **1115** *sqq.*; five, in the Hindu system, *136*;

fuliginous component, **238** ; heart made to receive it, **168** ; how it begins, **171** ; in Chinese philosophy, *137* ; in pathology, *147* ; is not " soul," **235** ; its activity, **138** ; its constitution, is important to medicine, *23* ; languishing of, **343** ; motions of, in relation to mind-states, **341** ; movement in two opposite directions at once, **344** ; nature of, *136* ; not necessary to movement (argument from paralysis), **163** ; pervades body, *136* ; purification of, *264* ; quality of, effect of, **1101** ; quantity of, effect of, **1100** ; relation to anatomical organs, *145* ; relation to atmospheric air inhaled, **236** ; relation to innate heat, *141* ; to life, **165** ; to metabolic changes, *142* ; to cycles of the outer world, *147*(*d*) ; of oxygen to, *137* ; to temperament, **171**, *139* ; to will-power, *140* ; retained by a rarefaction of skin, **415** (vi) ; source in the finer particles of the humours, **169** ; state of, influence on faculties and talents, **1109**, **1110** ; substance of, is water, **237**, *137* ; synonyms, *28*, *129* (6), *136* ; types of, associated with blood-states, **1117** ; type depends on the emotion, **1111** ; versus organs, *re* humours, **162** ; weakness of, **443** (ii)

Breathing, difficulty of, in infants, **723**

Breaths, three—natural, animal, vital, **170**

Brevity consistent with deep knowledge, *7*

Broad pulse, characters of, **558**

Bronchitis in winter, cause of, *179*

Bubo, what it is, **209**

Bulky stools, **675** (4)

Bursting of abscess into sputum, vomit, urine, fæces, **509**

C

Cachexia = tumefaction with gas, **211** (4)

Cadence in Arabian poetry. effect of, *219*

Calcareous serous humour, **74**

Calculus, **420**, **425** ; urine in, **636**

Calefacients, **415**, **830** ; as refrigerants, **416** (3)

Cancer, a condition of, is entry of S into cycle, **213**, *147*

Cancerous swelling, **213**

Canon : applied to modern clinical diagnosis, *280* ; to modern treatment, *285* ; to pathology, *273* ; is a précis, *7* ; would sometimes help in modern practice, *37* ; meaning of the word, *10* ; to be memorised, *7* ; useless for modern out-patient department or ward teaching, *34* ; written at the instance of a friend, **2**

Capacity for life, conditions necessary for, **1090** ; for rational life, ditto, **1090**

Capillaries of liver, **102** ; described by Avicenna, *32* (*c*)

Carbon-centric v. oxycentric compounds, etc., *92*

Cartilage, functions of, **116** (2)

Cataract, signs forewarning, **878**

Cause, definition of, **191** ; in medicine is not an *efficient* cause, *166* ; and malady and symptom, examples, **194** ; of compositional disease, **207** ; of death, **61** ; of delight and sadness, extrinsic, **1104** ; of failure of innate heat, **58** ; of humours (Table), **106** ; of increase of atrabilious humour, **108** ; of movement of the humours, **112** ; of numerical decrease, **428**

Causes : concerned in the " dance of the elements," *102* ; four kinds of, **13** ; must be understood before knowing how to preserve health or remove ill-health, **14** ; of disease, facultative, classification, **399** ; of disease, list of, according to Paracelsus, *199*, footnote ; three groups of, **231** ; three steps in substantial change, *69*

Caustics, mode of action, **1044**

Cauterisation, general principles and objects, **1072** ; of skull, precautions in, **1072**

Celestial factors, on climate, **306**

Cells are changing physical things as well as chemical, *95*

Cerebral diseases, effect on pulse, *233*

Chalky waters, baths of, action of, **408**

Chalybeate waters, **384**, **408**

Channel water, **383**

Channels, agents for opening, **421** ; of the body, **911** (footnote). See obstructions

Change (dynamic) is universal, *66* ; from one physical state to another as well as chemical, *95* ; in the human being, *83* ; of diet, ill effects of, if from light to heavy, **787** ; of mode of vital force accounts for changes in organs, **72** ; which the liver makes in the blood, **104** ; of elements exemplified in chemistry (glucose to alcohol), *87*

Character: and emotional type belong together, *164* (IV); and physique, *163* (i), *164* (IV); delineation, *162* (i), *163* (i); is inherent and unalterable, *164* (IV); inherited, may depend on breath of parents, **345**

Characters of good (human) milk, **700**; of good wet-nurse, **700**; of inhabited regions, **318**; shown in outward form, *25*

Character-types: Sufic classification, *164* (IV); versus physique known to Chinese *25*,

Chart: of mind, description of, *159*; of correlation of faculties, *158*; co-ordinating terminologies, *155*; of Chinese pulse, *208*

Cheerfulness belongs to air element, *78*

Chemical changes in body correspond to an Eastern court, *93*; exemplified, *87*

Chemical structure determines anatomical structure, *124*

Chemistry of life viewed mystically, *93*, *94*

Childhood, definition of, **52**; urine in, **670**

Chinese: cosmogony and Avicenna, *30*; diagnosis disconcertingly accurate, *36*; did not borrow from the Turks, *8*; philosopher's view of Western world, *6*; studied character and physique, *163* (i) (footnote); world-conception not lightly to be rejected, *30*

Choice of drugs for a given case, *290*, *291*, **1120**; of food according to climate, **313** *sqq.*; of various methods of treatment, rules for, **1051**

Choking of breath = retarded or arrested oxidative processes, **442**; in plethora, **442** (footnote), **590**

Choleric atrabilious humour, **94**

Chord-like pulse, **549**

Chronic intemperament, treatment of, **926**

Chyme, quality of, according to food, **360**

Chyle taken up by liver, **102**

Cineritial urinary sediment, **658** (9)

Circulation long known of, but not anatomically visualised, *32*; Chinese idea of, *32* (Wieger); circulation of breath not anatomical, *144*; rate of, not realised by Chinese, *32* (*b*); and by few persons to-day, *ib.*; the old idea, **116**

Clarified butter, **673**

Classification: of disease (Galenic), **224**; of errors of development (Abbott), *192*; of members into simple and compound, **115**; of members according to action, **124**; of members into principal and auxiliary, **123**; of members according to faculty, **117**; according to their origin, **125**; into preparatory and auxiliary (table), **123**; of temperaments, **30**; varies with personal taste, *173*

Clay-coloured stools, **675** (3)

Clear urine, significance of, **620**

Climate, **305**, *sqq.*; and body, *181*; as part of regimen, *254*; factors on which it depends, *190*; icy, travelling to, **889**; of one's locality to be studied by the physician, **259**; treatment of disease by, **313** (rheumatic cases), **324** (nerve and heart), **327** (nerve)

Clot, man created of, **679**; source of life-germ, **125**

Clothing—as part of regimen, *254*, rules, *254*

Coats of hollow organs, purpose of, **131**

Cogitative faculty, **179**; seat of, **179**; difference from inspiration, **179**; more perfect in man (St. T.), *129*

Coitus, **820**; effect of, on body, *196*

Cold: action of, **152, 189, 418**; as a helper of attractive faculty, **189**; atmosphere, effect of, **278**; on body, **313**; bath, effect on pulse, **596**; countries, effect on body, **320**

Cold intemperament: and urine, **620**; odour of urine in, **645**; of kidneys, sediment in urine, **658** (4); rectification of, **868**

Cold: intense, why it kills, **894**; relation of, to faculties, **152**

Cold seasons, diseases of, **268**; cold swellings are painless, **506**; classification of, **211**; cold temperament, degrees of, in the various organs, **48** (and see "intemperament")

Cold temperament, foamy urine in, **651**; food suitable for, **771**; functions in, **488** purgation in, **986**; regimen for, **868**; signs of, from form, **481**

Cold, treatment by, **911**

Cold water, plunging into, for frostbite, **872**; action of, **388**

Collective formulæ for body, *142*

Colic due to biliary obstruction, **83**; colic in babies, **726**; urine in, **668**

Colour, abnormal, a sign of disease, **454** (6), *282*

Colour and movement of humours, **346a**

Colour: change of body as a whole, meaning of, **478**; disfiguring—causes of, and classification of, **221** (*a*); indicates the temperament, **476**; guide for treatment, **476**
Colour of hair, a sign of temperament, **472**
Colour of urine: black, **615**; compound, **626**; green, **614**; red, **610**; white, **618**; yellow, **609**; of urinary sediment, significance, **660**
Colours affect the movement of the humours, **112**
Colours, taste for, depends on breath, *139*
Combinations of dishes, **772**
Commemorative signs, definition, **452**
Commendable waters, **372**
Common sense (scholastic term), **177**; site of, **177**; versus magination, *151*
Complexion, care of, when travelling, **897**
Composite disease, definition, **205**
Composite sense, **177**
Compositional diseases due to retention, **394**
Compound: colours of urine, **626**; fracture, **431**; intemperaments, classification of, **40**; pulses, **522**
Compulsory visibility, law, *106*, *125*
Conception: and emotional influence on product, **345**; factors in production, **345**, footnote
Conceptions in Canon not recognized in modern medicine, *23*; in modern medicine not known to Avicenna, *31*
Concepts versus Images, *161* (*c*)
Conditions requisite before causal agent effects illness, **233**
Configuration, disorders of, **199**
Conflict between self and disease, **562**
Congenital intemperament, **853**
Conjoined causes, **231**
Conscience, list of adjectives relative to, *164* (IV)
Consistence of fæces a sign of disease, **675** (2); of sediment of urine, **661**
Constants and variables for each person, *270*
Constipation and diarrhœa alternating, treatment of in old persons, **858**
Constipation: due to drinking stagnant water, **380**; during dentition, **715**; habitual, a sign of intemperament, **491**; produced by cold, why, **278**
Constitution: current ideas on, *27*; formulæ descriptive of *272*(*2*); in terms of *m* and *f*, *58*; only known when numerous factors are known, *27*; meaning of term, *27*; not understood by modern practitioners, *27*; versus "make-up," *27*; versus temperament, *27*; view of Paracelsus, *183*. See "temperament."
Contamination of air by noxious trees, vegetables, trades, **276**
Contentive factors of pulse, **552**, **554**, *sqq.*
Continuous pulse, **538**
Contrary maladies conjoined, treatment of, **923**
Contusions, treatment of, **1070**
Convulsions: due to dryness, **716**; teething, **716**
Cordial medicines, mode of action, **1119**
Corpulence = plethora of fat, **442**
Correction of intemperaments, **930**, **931**, **932**
Correctives: for unwholesome food, **792**; for heavy foods, **789**; for repletion, **793**; for wine, **805**
Correlation: between modern biochemistry of blood and humours, **98**; of various faculties, *158*, *sqq.*
Corruption, *144*; and generation, *68*, *88*, *98*
Coryza in infants, **724**
Cosmology: of Avicenna, **19-25**, *268*; ancient, *54*
Cough in infants, **724**
Counter-inebriants, **813**
Courses of a meal, **796**
Cradle-song, **698**; example, **712**, *240a*
Creeping pulse, **541**
Crisis of fevers, urine in, *238*
Criteriology necessary to medicine, **16**
Critical polyuria, **616** (*d*)
Crude serous humour, explanation of, **80**
Crude humours in blood-vessels, **837**; and in lassitude, **823**
Crying, incessant, or persistent, in infants, **717**
Cuisine of Arabs not unlike Southern Spanish of to-day, *249*

Cupping, **1030** :—age limit for, **1035** ; breasts for uterine trouble, **1044** ;—glasses, points of application, **1032** ; time to use, **1031** ; time of day for, **1031** ; in middle ages, *261* ; purposes in view, **1033** ; uses in various parts of body, **1032** ; versus venesection of saphenous vein, **1032** (5)

Cuprous waters, effect of, **408**

Curability and incurability, **227** ; which diseases are, **327** ; depends on expiative factors, *201*

Curly hair denotes hot and dry temperament, **471**

Curved nails denote long-standing disease of bronchi, **454** (9)

Cycle of pulse, duration of, **524**

Cycles, bacteriological, *187* ; of breath, *105*, *138* ; planetary versus climatic, *194* ; seasonal, effect on body, **296-301**

Cyclical changes in atmosphere, **277** ; in physiology, *83*, *85* ; disorder of pulse, **530**

D

Daily actions largely instinctive, *153*

Damp countries, effect on body, **321**

Dance of elements, *83*, *95*, *99*, *142*, *149* ; and death, *149* ; and disease, *149* ; when it stops, all ceases, *93* ; dancers' feelings not the concern of composer or conductor, *84*

Dancing causes abortion, **739** ; without personal contact, a type, *84*

Darkness useful for certain maladies, **112**

Dead body carries its secrets with it, even after autopsy, *127*, *164* (IV)

Death due to failure of innate heat, **684** ; explained, **681-2** ; produced by intense pain, **1073**

Debility, causes of, **443**

Debul, **343** ; **199** (ii) footnote. See Decline

Deception of doctor by patient, attempted, **673**

Decline, **343** ; what it is, **221** (4). See Debul

Decree and duration of life, **61**, *111-115* ; decree of Allah, **56**, *300*

Decrepit age, **51** ; urine in, **670**

Deepening of yellow colour in urine, significance of, **611**

Deep-seated inflammations, treatment of, **1050**

Deep ulceration, three rules for treatment, **1064**

Deformities, scholastic explanation of, *120* ; agents which cause, **419** ; as compositional diseases, **205**

Degrees of diseases (weakness, depravity, abolition, or hindrance to function), **488** ; **226**

Delay in treatment, danger of, **918**, **919**

Delicate build of body denotes cold and dry temperament, *202*

Delight depends on breath-type, **1099** ; effect on pulse, **601** ; erroneous view regarding, **1097** ; relative, **1098** ; synonyms, *164* (II)

Demonstrative signs, definition, **452**

Density of urine, definition, **627**, *237a*

Dentition, disorders of, **715**

Depraved humours as cause of pain, **439** ; injurious effect of, **680**

Depression, emotional, versus timidity, **1116**

Depuration of breath, **236**

Description of a pulse-beat, **516**

Dessicants, **418**

Desiccation of objects in the air, explained, **254**

Desire, *159* (II) ; and breath, *148* ; due to loss of balance, *147* (*c*) ; not due simply to need for nutriment, **185** ; the source of all life, **1086**

Destiny, *22*, *199* ; and freewill, *115* ; decreed, *113*, *114*, *115*

Developmental errors, **199** (1)

Diagnosis : difficulty of *re* primary and secondary symptoms, **460** ; of character-type is like reading a foreign language, *280* ; of inflation, **505** ; of nature of swelling in terms of its humour, **507**

Diagnostic signs of temperaments, are ten, **465**

Diagrams : illustrating the composition of glucose, *87* ; the incomprehensibility of Ultimate Truth, *appendix 2* ; the nature of disease, *278* ; of the faculties, according to Avicenna, Arabic, Sufic, Jili, modern and scholastic philosophies, *155*

Diaphragmatic pleurisy, pulse in, **454**

Diarrhœa : as cause of weakness, **445** ; in dentition, **715** ; protracted, effect on pulse, **602**

Dicrotic pulse, **546**, **566**, *222*

Diet: according to season, **760**, **764**; after cupping, **1036**; as mode of treatment, **906,** *295*; during evacuant treatment, **941**; for hot countries, **886**; for lassitude, **834**, **838**, **842**; for old age, **855**; for people with good digestion, **783**; in inflammatory lassitude, **851**; in spontaneous lassitude, **842**; in spring, **873**; in winter, **876**; of wet nurse, **699**, **702**, **708**; reducing, **907**; the head of healing, **759**; when travelling, **882**
Dietetic errors: account for most diseases, **347**; and culinary art, *248*
Dietetics, **759-792**, *248-253*
Difference: basic, between the Canon and modern medicine (table), *19*; between ancients and moderns is (*a*) outlook, (*b*) topic, *37*; between instinct and reason *152*; between waters, **363**; forms of anger, *139*
Digestibility of foods, *195* (1)
Digestion: aided by sleep, **337**; better in winter, **292**; defective, fetid odour in, **648**; defective, urine in, **628**; depraved, urinary sediment in, **658** (7); disturbance of, in infants, **725**; good, urinary sediment in, **653**; in stomach, theory of, *247*; poor, sign of moist temperament, **473**; produced by heat of members enveloping stomach, **100**; *sensu strictiori*, **149**; urine during, **623**, **624**; variations in urinary characters during, *238*; within blood-vessels, *32* (*d*)
Dilated heart due: to joy, **199** (i. **3**); to pain, *ib.*
Discharges, abnormal, classified, **458**; as sign of disease, **458**
Discharge of waste matters, mechanism of, **188**
Discontinuous functions, *106*
Discussion as to whether brain or heart is more important, **118-122**
Discutients, **830**
Disease: a personal matter, *199*; arising from drinking marshy water, **379**; classification of the synonymous terms, *168*; compositional, cause of, **207**; definition of, **192**, **231**; degrees of, **226**; due to altered rhythm of the breath, *147* (*b*); due to interference with flow of breath, *147* (*a*); due to retention of wastes, **394**; expiative, *199*;—germs carried underground, *177*; in one organ involves another, **225**; is not in-formed matter, *166*; may cure disease, **228**; modern and ancient views contrasted, *167*, *273*; not a reaction, *167*; retributive, *199*; signs of, classified, **454**; stages of, **222**; stages of, bearing on treatment, **917**; symptoms and cause may be all one thing, **195** (*e*); transmission of, **229**; treatment of, general rules for, **905**
Diseases: associated with variations of earth temperature, *179*; of ground water, *178*; benefited by cold atmosphere, **313**; by hot atmosphere, **313**; causing deformity, **419**; dependent on direction of wind, **314-317**; following a very hot and dry summer, **303**; number of, limited in reality, *173*; modification of, by summer, **285**; of autumn, **289**; of cold season, **268**; of expression, **286**, **294**, **300**; of hot season, **269**, **286**; of infancy, **714**; of southerly countries, **329**; of spring, **282**, **282**; of winter, **294**; which cure diseases, examples, **228**
Disfigurements, **221**
Dishes, Arabian, *251*
Disinclination for exercise, meaning of, **499**.
Disintegration, *68*, *142*
Dislocation, **198** (3); definition, **201**; treatment of, **1069**
Disorderly irregularity of pulse, **564**; pulse, **530**
Disorders: of configuration, **198**; of imagination, **181**; of temperament defined, **198**; of temperament, treatment of, **911**, **925-933**
Displacement of parts, causes, **424**
Disposition: **1094, 1123**; St. Thomas on relation of, to quality of soul, *272* (2) footnote; see also under " character ".; states of body and mind.
Distemper, definition of, *168*, B. ii
Distillation of water, **369, 898**
Distinction between congenital and acquired temperament, **467**
Diurnal variations of pulse, *225*
Divergent views about relation between temperament and breath, **165**
Diversity of perfection, intended, *109*
Doctor should be himself healthy to feel pulse properly, *207*
Doctrine: of imponderable elements, *73*; considered statically, *73-82*; dynamically, *83-89*; of Mean, *109*
Dominant element colours all parts of the being, *82*
Douches, **1016**; to increase fat, **871**; over head, **1016**; with herbs as showerbath, **414**
Drastic purges, how to mitigate, **993**
Drawn blood separates into four layers, **96**

Dreams : agreeable in equable temperament, **494** ; of fetid urine denote plethora of faculty, **499** ; show character of dominant humour, **492, 500** ; show kind of temperament, **492** ; show state of health, **492** ; warming oneself, **492** ; which show plethora, examples, **498**
Drinking at meals, **780** ; rules regarding, **780**, **799**
Drinking-water, see Water, and **898** ; precautions *re*, on journeys, **898-902** ; purification when travelling, *ib.*
Dropsical swelling, **211** (3)
Drowsiness, a sign that sanguineous humour is dominant, **500**
Drug treatment, based on elaborate considerations, *37*, *271*, **1119-1121**
Drugs and pulse, *225* ; cordials, action of, **1119** *sqq.*
Drugs, list of, in Canon, which are still used, *Appendix 3*
Dry air defined, **250**
Dry atmosphere, effect of, **278** ; on body, **313**
Dry cupping for pain of flatulence, **1083**
Dry hiccough, **455**
Dry intemperament, rectification of, **867**
Dryness, action of, **153** ; as cause of pain, **432** ; of nerves, **839** (iii) ; part played by, in digestion and nutrition, **153**
Dry skin, **839**
Dry stool, **675**
Dry temperament, degrees of, in the various members, **50** ; in regard to purgation, **981** ; signs of, from the form, **481**
Dual functions of bile and atrabilious humour, **89**
Dusty air, effect on body, **839**
Dwelling, choice of, *254*
Dynamic aspect of matter and form, *66-72*
Dyscrasias, **38**
Dysentery from drinking "lead"-water, **375**
Dysmenorrhœa, treatment by cupping, **1033** (vi)

E

Ear, diseases of, in infants, **722**
Earache, in infants, **722**
Earth : a lung, *175* ; breathes out vapours, **255** ; definition and characters, **21** ; dominates in old persons, **62** ; in winter, heat concealed in, **256** ; a great stomach (Paracelsus), *177* ; not the literal earth, *73* ; provides firmness and rigidity to parts, **679** ; purpose of, **21**
East winds : effect, **307** (*e*), **316**
Easterly countries, effect on inhabitants, **330**
Eastern city, life of, a picture of life within the body, *239*
Ebb and flow, a law, *32* (*d*)
Education up to thirteen years of age, **733-735**
Effect : of atmosphere on colour of hair, **474** ; of conception on lactation, **708** ; of diseases, primary and secondary, **459-464**
Effeminate build denotes dominance of serous humour, **500**
Effete matter of gall-bladder, what it is, **82**
Efficient causes, **13** (2) ; defined, *58* ; are the faculties, *71* ; in the human being, *72* ; of humours, **106**
Ego, types of, *164* (IV)
Elderly persons may take wine, **810**
Electric potential, change of, versus breath, **142**
Elementary bodies have not capacity for life, **1089**
Elementary tissues, the, **116**
Elements : all four in each, **19** ; and functions in body, *78* ; and mental states, *78*, *160* (III) ; and systems of body, *78* ; are virtual, not material, **19** ; defined, **19** ; doctrine of, *29*, *55-108* ; five versus five ethical principles, *79* ; formula of constitution in terms of, *172* (2) ; four form a cosmogony, *29* ; "four, or five ?" **20** ; light and heavy, **20** ; imponderable, a fundamental conception with Avicenna, *23* ; examples, list of, **309** ; lose their individuality in the compound, **30** ; position in nature, *53* ; synonymous words, **19** ; the mighty servants of God, *55* ; various manifestations of, **309**
Elephantiasis, **199** (ii), **424** ; is endemic in Alexandria, **229** (3)
Emaciation : cf. debul. **221** (4) ; morbid, *ib.* ; remedy for, **870** ; a sign of dominance of atrabilious humour, **500**
Embryo, source of nutriment, **708**

Emesis : applicable to thin persons, **956** ; articles of food which assist, **1003** ; bye-effects and their treatment, **1012** ; contra-indications, **999** ; disadvantages of, **1010** ; effects on blood-state, **1117** ; evil effects of, **1011** ; failure of, ill-effects of, **1006** ; food and, **1002** ; ill-effects of, **1007** ; influence of, on breath-type, **1111** ; not to be habitually used for repletion, **1011** ; objects of, **1000** ; procedure, **1001** ; proper time for, **1008** ; symptomatic bye-effects, **1012** · what is meant by the term, *256*.

Emetics which are also purges, **958**

Emotion : defined, *159*

Emotional : depression, effect of, **1114** ; disturbance as desiccant, **418** ; make-up, formulæ for, *164* (II) ; state and pulse, **518** (4) ; states as calefacient, **415** (iv) ; states as basis of occult phenomena, *162* (iv)

Emotions : and breath, *148* ; **341-346, 1098** ; and humoral formula, *160* (5) ; and pulse, *225*, *233* ; change quality of mother's milk, **700** ; details regarding, *160*, **1092-1118** ; effect on body, **345** ; interact with intellect, *165* (I) ; interact with reason, *165* (III) ; interact with Will, *165* (III) ; list of, *164* (II) ; list of words descriptive of, *ib.* ; as refrigerants, **416** (6) ; objects of, *159* ; part played by imagination, **1118** ; physical effects of, *160* (5) ; relation to blood-state, *160* (4) ; relation to elements, *160* (4) ; tabulated, *160* (3) ; theory of, in relation to breath, elements, humours, *160*, **1090** *sqq.*

Empty pulse, **526**

Enæorema, **662** (last paragraph)

Encumbrance due to obstruction, **502**

Endemic elephantiasis, **229** (7) ; endemic goitre, **229** (D)

Endowments ; one is at expense of another, *165* (IV)

Environment, kinds of, *165* (III)

Enemas : **1014** ; advantages of, **1014** ; best time for, *ib.* ; for old persons, **859** ; materials for, *258* ; modern usage, *259*

Environment, kinds of, *165* (III)

Epilepsy, urine in, **632**

Epileptic attack : warded off by evacuant treatment, **953** ; annulled by pæony, **350**

Epistaxis a good sign in internal inflammations, **512**

Equable : scope of term in medicine, **31** ; temperament, definition, **30** ; temperament, evidences of, **494** ; — functions in, **488** ; — what it is and what it is not, **31** . pulse, **529**

Equal pulse, **529**

Equilibrium, the ideal mean, *82*

Equitation, **739**

Equivalents of the heavy elements, **20** ; of the light elements, *ib.*

Erroneous views as to primary source of functions, **141** ; of ancients only apparent, *6*.

Errors of development, tables, **199** (i)

Erysipelas, definition, **209**

Essence, definition, *58*

Essential : causes of disease, examples, **232** ; considerations in the art of preserving health, **688**

Ether, and Yin and Yang, *103* ; — of the constitution, *81* ; (ether = light).

Ethical principle of man, *109*

Evacuation : amount to go to, **935** ; choice of, eleven factors, **934** ; choice of time for, **935** ; five rules regarding, **935** ; of humours, modes of, **936** ; of pathological matter, **395** ; of retained matter, effects of, **396** ; as cause of weakness, **445**

Every animal has its own temperament, **45**

Evidence of proper functioning of organs, **453**

Example of stage of cycle towards visibility, *95*

Excessive evacuations, effect on body, **397**

Excrementitious atrabilious humour, varieties of, **92**

Excrementitious : fluids, **69** (*b*) ; — form of atrabilious humour, **90** ; — serous humour, **74**. See Superfluities

Exercise : after meals, **763** ; amount of, rules regarding, **747** ; an evacuant, **737** ; appropriate for elderly persons, **863** ; as part of regimen to prescribe, *254* ; definition of, **593** ; degrees of, **334** ; duration of, **744** ; effect on body, **333**, **334** ; effect on pulse, *225* ; excessive, effect of, **416** (4) ; features of, in effect on body, **333** ; for lassitude, **835** ; for old age, **854**, **863** ; for wet-nurse, **708** ; general discourse, **736** ; graduation of, **748** ; in hot intemperaments, **866** ; in relation to meals, **776** ; in spring, **873** ; lack of, as cause of inflammation, **431** ; moves the humours, **112** ; of infants, described, **712** ; precautions *re*, before taking, **745** ; regulation according to season, **746** ; rules

and regimen, *254*, **747**; value of, *242*; various forms of, **738**, **739**; why necessary, **737**
Exhaustion from excessive purgation, remedies for, **991**
Expansion of parts, agents which prevent, **426**
Expiative causes of disease, *201*
Expression, diseases of, **286**, **294**, **300**; sign of state of mind, **492**
Expulsive faculty, **150**; versus dryness, **157**
External anatomy, a guide to internal function, *127*
External and internal features of body belong together, *25*
External: senses, **175**; signs of hot intemperament, **865**; swellings, signs of, **506**
Extracorporeal causes, **234**, *sqq.*
Extramundane influences on human body, explained, *108*
Extraneous causes of colour change, **480**; extraneous heat from putrescence, **358**
Eye, diseases of, in infancy, **721**; colour of, a guide to the temperament, **477**, *282*. Eye of Taoist: i.e. mystical perception of the truths of Nature, *281*

F

f, symbol of "form," *56-72*
Face-powder, scented, **897**
Factors concerned in production of the pulse, **552**
Factors which destroy the body, **681**; which govern the healthiness of a place, **318**
Facts, what they are and are not, *12*; Appendix **2**
Faculties: as efficient causes, *71*; depend on flow of breath, **442**; have not priority, but relation, **121**; in relation to formation of humours, **107** (II); of generation, **145**; to foster, in treating a case, **687**; versus function, **136**
Faculty: alterative (al-mughayyira), *131*, **149**; animal (psychical[163]), (an-nafsaniyya), **174**; attractive (al-jadhiba), *131*, **147**; apprehensive, **180**; cogitative, **179**; expulsive (al-dafi'a), *131*, **150**; generative (al-muwallida), *131*, **145**; growing (auxetic) (al-murabbiyya), *131*, **143**; natural (al tabi'iyya), *131*, **142**; nutritive (al-mughadhiyya), *131*, **143**; perceptive (al-hiss), **176**; reasoning (siyāsa), **176**; retentive (al-māsika), *131*, **148**; three kinds of, **137**; vital (al-hayawaniyya), **137**, *129*, **140**; weakness of = hypofunction, plethora of = hyperfunction **136**, **628**
Fading pulse, **547**, **568**
Fæces, characters of, in health and disease, **675**, **676**
Fallacious argument *re* errors of diagnosis from external features, *25*
False occult phenomena, *162* (II); false thirst, treatment of, **798**
Familiarity with things goes with ignorance about them, **1127**
Famine and plenty, ill-effects, **761**
Fat and oil of body reveals temperament, **468**
Fat of blood nourishes kidneys, **104**
Fate: *201*; Chinese proverbs on, *113*; as destiny, **686**; not untrue but pursued too far, *ib.*; explanation of, *113*; life-term fixed, **686**; of food-residues, **111**
Fatigue in travelling, **885**; fatigue-pain, **434** (5)
Fatness means moist and cold temperament, *202*
Fats, action of, **423**
Fattening regimen, **870**
Fatty: food, objections to, **794**; sediment in urine, **658** (3); stools, **675** (3)
Fear: breath in, **344**; earth element, *78*; effects of on body, **346** (*d*); effects on body and mind, **1116**; effect on pulse, **601**; objects of, *159*; refrigerant, **416**; synonyms, *164* (II)
Feeblemindedness in offspring after cupping parents, **1032**
Feeble pulse, **523**, **561**
Feel of patient, **465**
Female: menstrual blood and embryo, relations between **126**; sperm, part played by, **679**
Fermentation: in humours, *32* (*e*); in stomach from bad food, **767**
Ferruginous waters, use of for baths, **408**; effect on body, **384**
Fetid odour of urine, **646**, **648**
Fevers: blood-letting in, rules for, **1029**; faulty diet predisposes to, **791**; in infants, **732**; pulse in, *233*; urine in, *238*
Few able to interpret the secrets of the autopsy, *127*
Fictitious appetite, **761**
Fidgeting, sign of gaseous plethora, **504**
Fig-water, distinction from urine, **674**
Filaments in urine, **671**

Filtration of water through sand, **898**
Final cause, defined, *59*, **13** (4); of disease includes retributive causes, *201*; of humours, **106**
Finger-nails, a sign of the temperament, **466**
Fire: and breath, *139*; characters of, **24**; definition of, **24**; some equivalents, *78*; from air, **237**; nature of, **24**; penetrative power of, **24**; provides maturative power of body, **679**; St. Thomas on, in Sum. Theol., **24**; **78**, i., p. **77**. Note: "digestive fire" (Charaka[155]); innate heat.
First period of life, **52**
First principles have not capacity for life, **1088**
First stage of digestion, **101**
Fishing, a form of exercise, **741**
Fistula formation, **1068**
Fixed and bound chemical elements, *90*
Fixed states of body, *166*
Flatulence in infants, **726**
Flatulent pain, relief of, **1081**; treatment of by dry cupping, **1083**
Flesh: akin to blood, therefore does not need spaces or cavities, **133**; description of, **116** (9); list of components, *ib.*; receives but does not give, **120**; used synonymously with "nature," "vice," and "passibility" (i.e. perception of pain) in S.T.
Fleshiness denotes a kind of temperament, **468**; denotes hot and moist temperament, **468**
Fleshy sediment, in urine, **658** (2)
Flickering pulse, **545**
Flow of humour, sign of loss of continuity, **513**
Fluids falsified to simulate urine, **603** (12)
Fluids of the body: circulate in B.V., C.T. spaces, as "eau de constitution" of the tissues, as various substances, *123* (*c*); versus humours, *116*
Foam of blood, **82**; of urine, significance, **649-651**
Fœtor as a "disfigurement," **221** (3)
Fogs, effect on mind, **279**
Food and drink, **347-392**; effect on pulse, **583**; regimen, **759-814**; should be prescribed, *254*
Food: and emesis, **1002**; best for people, *195*, **769**; cycle, in terms of visibility, *77*; effect on body, **357**; for one's physique, **770**; "hot" and "cold," meaning of **351**, **353**; must be in apposition with gastric mucosa, *185* (1); of the nation the best, **769**; quality of, effect on body, **347** (*a*); — stuffs classified, **359**; substance of, effect on body, **347** (*d*); value according to amount of residue, *195* (4).
Foods: and medicines in intemperaments, **493**; choice of, according to rate of absorption, **909**; classification according to humour produced, *195* (4); to quality of chyme, **360**; depurative properties, *195* (4); making bad chyme, **360**; physiological value, *195*; which increase alvine discharge, *255*.
Footwear, when travelling in cold countries, **894**
Forces of nature = efficient causes, *71*
Foreign heat, meaning of, *203*; stands for bacterial action, *141*, *283*, **485**; effect on temperament, **483**
Form = property (active or passive), **349**, **1123**; and assimilation, **347**, **348**; is motor, and not breath, *52*; is not a quality, **348**, *265*
Form (*f*): of food, part played by, **348**; of medicament, part played by, **356** (B)
Form of members, and temperament, **481**
Formal cause, **13** (3); of humours, **106**
Formicant pulse, **542**, **572**
Formulæ describing the facts of human "nature," *150*
Four periods of life, **51**
Fourth digestion, **110**, *277*
Fracture, best diet for, **1061**; general treatment, **1061**
Frailty, due to intemperament, **230**
Freckles, **221** (2) (iii)
Freewill and destiny, *115*
Frequent bathing, effects of, **403**
Friction, **749**, **750**; in the nights, **750**; objects of, **749**; procedure for, **750**; restorative, **750**; time for, **749**; wood-cut illustrating, **749**
Frontispiece referred to, *209*
Frostbite, **428**, **894-896**; measures to remedy, **891**
Frothy stool, **675**

Frozen fruits, **895**
Fruit: value of, objections to, **790**; nutritious, **759**; various, in dishes, *251*
Fuliginous component of breath, **238**
Full pulse, **526**; causes of, **573**
Function: coterminous with structure, *95*; hindrances to in diagnosis, **463**; kinds of interference with, **458**; — testing via urine, *239*; versus faculty, **136**
Functional capacity: of liver, urine in, **621, 626** (1), *658* (1), *238*; of organs, *82*; of organs is a time-relation, *272* (2); of spleen and kidney, *82*
Functional efficiency, meaning of, re temperament, **488**
Functions: of atrabilious humour, **87**; of body, **185**; of serous humour, **73, 106**
Furfuraceous sediment, **658** (1)
Furunculosis in infants, **731**

G

Galactogogues, list of, **705**
Gall-bladder bile is effete matter, **82**
Gall-stone colic, **393**
Ganglia, characters, and treatment (by a blow), **216**
Gangrene: bone involvement in, treatment of, **1059**; excision of healthy margin, **1058**; from frostbite, treatment, **896**; treatment, **1057**, **1060**
Garlic and lettuce, fate in body, **356**, A, ii, (*a*)
Gaseous distension, signs of, **504**: — matter in swellings, **431**: — swellings, **219**; treatment of, **1052**
Gastrectasis, **440**
Gazelle pulse, **539**
Generation and corruption, *142*; versus temperament, *28*
Generation compared with cheese-making, **125**
Generative organs, **123** (4)
Gentleness, goes with dry temperament, **492**
Genu valgum, **199** (i)
Geographical position a factor in the choice of kind of evacuation, **934** (9)
Germination of seeds, description in terms of "elements," *87*
Gestures: reveal kind of humour dominant, **501**, *280*, *282*; rapid, denote hot temperament, **492**
Ginger, for old people, **856**
Gingivitis, **715**
Glandular swelling, v. ganglia, **216**
Glutinous medicines, effect of, **1044** (iii)
Goal of life, *241*
Goats, urine of, **673**
Golf-stick: see Polo, **739**
Good-humoured, real meaning of, **68**
Good memory, a sign of dry temperament, **492**
Good power of observation, significance of, **492**
Good prognostic signs from urine, **634**
Goose-skin, meaning of, **823**
Gout attack warded off by evacuant treatment, **953**
Graduated exercises, **748**
Grapes, **796**
Gravel, **658** (8)
Green, shades of, **614**; stools, **675** (3)
Grey hair, cause of, **473**
Grief, effect of, on pulse, **601**
Griping in infants, **726**
Gritty urinary sediment, **658** (8)
Ground air, movement of, *175*; and choice of house, **332**
Ground-water, diseases associated with, *178*; movement of, *176*
Growth, *3*; faculty of, **143**; nature of, *ib.*

H

Habits a factor in choice of mode of evacuation, **934** (10)
Habits and customs account for cupping, *262*
Hæmaturia, **658** (9)
Hæmopoietic centres, what they are, **72**

Hair : and nails as excrement, **111** ; affections of, **221** (1) ; as guide to kind of temperament, **470** ; is ether, **50** ; — like sediment, **658** (6) ; rate of growth indicates kind of temperament, **470**
Hand : position of when feeling pulse : patient's, **518** ; doctor's, *206* (3)
Hands : the clue to the state of the body, **452** (heading) ; the most attempered, **36**
Hard inflammatory masses, treatment of, **1051**
Hard pulse, cause of, **557**, **562**
Harmful effects of evacuants, treatment of, **943**
Harmonious succession of events, meaning of, *122*
Harmonious, definition of, **261** (footnote)
Harmony between various forms of doctrine of elements, *29*
Harsh pulse : causes, **565** ; due to inflammation in tender parts, **600** (4)
Harshness of body, causes of, **422**
Hastening treatment, danger of, **920**
Head, veins of, for venesection, **1023**
Headache as a disease, **195** (*d*) ; *170*
Headaches, " cold," showerbaths for, **414**
Healing, science of, **678**, *285*, *sqq.*
Healing : power, *162*, I ; *163*, iii ; miraculous, *163*, iii. c ; of solution of continuity, cause of delayed, **203** ; through vitality, *287*
Health : a harmony of the humours, *117* ; conditional on pure air, **240** ; requires persistent proper proportions in humoral formula, **97** ; evidence of balance between inflow and outflow, **398** ; (illustrated by diagram in *278*) ; not a rigid state, but a range, **689** ; of doctor must be good, *207*, *281* ; preservation of, essential considerations, **688** ; principles of maintaining, **685** ; signs of, classified, **453**, **494** ; healthy air, characters of **274-277**
Hearing, **175**
Heart : and arteries the receptacle of the breath, **515** ; is both corporeal and non-corporeal, *25* ; centre of body, **123** ; centre of life, of breath, *145* ; enlargement of, **1116** ; gives rise to breath, **124** ; is more than the anatomical organ, *123* ; is part of a composite, *25* ; seat of formation of the rarefied humours, **163** ; soundness of body conditional on soundness of heart, **123**, **119** ; source of all faculties of breath, **172** ; source of all functions ,**141** ; meaning of, three schools, *129* (8) ; root of faculties, **119** ; types of, *164* (IV)
Heat : action of, **190** ; and cold, action of in formation of humours, **107** (I) ; heating foods, **788** ; exposure to great, when travelling, **886** ; from putrescence (extraneous), **358** ; necessary to attractive faculty, **156** ; necessary to movement, **155** ; regulation of, *203* ; use of, in treating disease, **911**
Heavens, the seven and the twelve, *54*
Heaviness, sense of, a sign of obstructions, **502** ; significance of, **499**
Heavy elements and light elements, *77*
Heavy foods, correctives for, **789**
Hectic fever not as painful as tertian, **432** ; bath treatment of, **407** ; pulse in, **224**
Hellebore, uses of, **926**
Hemetemesis from protracted emesis, **1012**
Hepatic disease, urinary sediment in, **658** (1)
Hepatic insufficiency, urine in, **621**, **626** (1)
Herbage decays if dry season after dry winter, **304**
Herbal baths, **408** ; decoctions, distinction from urine, **674** ; douching with, **414** **719**, **732**
Heredity, diseases of (errors of development), **199** ; see Malconformation
Hernia in infants, **728**
Heterorhythm of pulse, **534**
Hiccough, **427**, **455** ; in infants, **725** ; post-emetic, **1012**
High resistance (of pulse), effect, *232* ; clinical causes, *232*
High altitudes, living at, **324**
Hippocrates quoted, **876**, **956**
Hirudiniform urinary sediment, **658** (10)
Histology : and function, *125* ; application of doctrine of four elements to, *95* ; importance of, **911** (footnote) ; of an organ the visible sum-total of chemical units, *99*
Homogeneity of fæces, **676** ; of urinary sediment, **654**
Honey confections not good, **796**
Hope, effect on temperament, **346**
Hopefulness, meaning of, **492**
Hot : atmosphere, effect of, **278** ; on body, **313** ; baths, action of, **402** (2) ; baths,

bad effects of, **407** ; effect on pulse, **596** ; countries, effect of, **319** ; explanation of, in regard to poisons, **483** ; food, meaning of, **351** ; intemperament, congenital, **864** ; ditto, physical evidences, **865** ; ditto, regimen for, **864** ; poisons, *203* (3), **483** ; pulse, **527** ; season, diseases of, **269** ; temperament, degrees of, in various organs, **47** ; ditto, functions in, **488** ; ditto, purgation in, **977**, **986** ; ditto, shown by jelal actions, **490** ; ditto, signs from the form, **481** ; water, action of, **390**

House : material used for, **332** ; types of, choice of, **332**

Human being : tabulation of distinctive characters, *129*, *272* (*2*) ; Buddhist view, *80*

Human life always the same at bottom, *14*

Humanitarian motives for practising medicine, *46* (ii)

Human nature is in-formed matter, *63*

Humectants, **417**

Humidity of air, effect of, *181* ; choice for house, **332** (10)

Humoral : disorders, venesection for, **1018** ; formula, *272* (2)

Humours : agitated by southerly winds, **315** ; are quasi-material, *116* ; as "principles" of the body, *116* ; definition of, **67**, *116* ; decomposing, cause harsh pulse, **565** ; discharge of — natural and unnatural, **207** ; how extracted from body : by purgation, **966**, by emetics, and by desiccant medicines viâ nostrils, **969** ; immature, remedy for, according as they are intra- (**848**) or extra- (**846**) vascular ; in autumn, **287**, **288** ; influenced by wine, **802** ; in rainy season, **299** ; in summer, **284** ; in winter, **293** ; kind of, diagnosis of, in lassitude, **844** ; move in spring, **281** ; not the same as humidities (ruṭūba), *Appdx.* ; as body fluids, **67** ; oxidised by waking state, **338** ; which are extravascular are amenable to purges, **968**

Hunger, **185** ; to quell, **884**

Hurried pulse, **528** ; cause, **559**

Husky voice, from drinking rain-water, **373**

Hydrocephalus, **719**

Hydromel, **804**

Hygiene : of dentition, **713** ; of infancy, **690-713** ; of lactation, **709** ; of period after dentition, **710** ; science of, **678**

Hyperfunction, **136**

Hypofunction, **136**

Hysterectomy, why harmful, *147* (*a*)

I

Ichorous sediment of urine, **658** (5)

Icy climate, travelling to, regimen for, **889**

Ideal temperament in man, **34**

Ideal underlying : both the study and practice of medicine, *292*, *294*, *300*, *appdx. 2* ; Moorish architecture, *5*

Idiosyncrasies against food, **768**

Ignorance about fundamental matters, **1128**, which are familiar, **1127**

I King, a great book, *83*

Ill-effects on infant, of over-suckling, **709**

Ill-health due to change of rhythm, *97*, *98*

Illness : precedes signs, in the case of plethora of faculty, **499** ; a relation to radiant life and breath, **231** ; severity of, a factor in treatment, **916**

Images, source of, in imagination *151*

Imagination : **178** ; effect on emotions, **1118** ; intellectual, *151* ; makes humours move, **112** ; position in chart, *161*, B ; rational, *151* ; scholastic view, *151* ; seat of, **178** ; sensuous, *151* ; versus apprehensive faculty, **180** ; vivid if breath dry, **1110**

Imaginative : faculty, **179** ; person, meaning of, **492**

Imponderables form a bond throughout nature, *76*

Importance of soil, re bacteria, *209*

Impressions : maternal, paternal, **345** ; on fœtus, **345**

Impure water, purification of, when travelling, **899-902**

Inability to nurse baby, **699**

Incessant talking, explanation of, **490**

Incisions, rules concerning, **1056**

Incompatibilities between drugs and constitution, *291* ; between foods, *195* (4), **672**, **795** ; between foods and constitution, *295* ; to be considered in prescribing regimen, *296*

Increase in size of body, causes, **428**

Incurable headache, **227**

Indigestion the origin of all sickness, **759**; secondary effects, **762**

Indisposition, definition of, *169*, B, ii (*b*)

Individuality, what it is, **1130**

Induration, **213**; of skin, **839**

Inebriation: how to procure, **811**; cause of rapid, **811**; preventatives, **811**

Inebriety: agents which remove, **813**; correctives for, **812**; stages of, in regard to mind, **1106**; state of mind in, **1107**

Inequable temperament, definition of, **30**; evidences of, **496**

Inequality of pulse-beats, **529**

Infancy, definition of, **52**; diseases of, **714**; hygiene of, **709**, *sqq.*; urine in, **670**

Infant: bathing, **694**; cord, treatment of, **690**; hygiene of, **690-713**; must be put on skin-rugs when it crawls, **712**; skin, treatment of, **691**, sleeping quarters, **693**; treatment via wet-nurse, **714**

Infant's blood, source of, **127**; mouth injured by bad nipples, **700**

Infatuation, meaning of, **492**

Infection from soil, *177*: transmission of disease by, **229**

Infirmities versus disease, **10**

Inflammation: signs of, **508**

Inflammative lassitude, treatment, **851**

Inflammatory: masses: effect on pulse, **600**; four stages of, **210**; swellings: causes of, **431**; guides to treatment of, **1048**; ditto, due to immediate causes, **1050**; treatment of, **1047**; with ulceration, treatment of, **1053**

Influence of atmosphere on body, **234** *sqq.*

Informative faculty, **145**

Infrigidants, effects of, **1044** (iii)

Infrigidation associated with desiccation, as factor in treatment, **912**

Injuries to which body is exposed, **680**

Innate cold, why non-existent, **486**

Innate heat: a factor in treatment, **930**; and exercise, **334**; and moisture, **33**, ii; and undue sleep, **340**; and vitality, *203*; dispersed by hot bath, **407**; effect of bath on, **403**; effect of repose on, **335**; function of, **484**; increased by food, **347** (2); in youth, **52**, **53**; loss of progressive, **683**; part played by, **484**; strangled by exercise, and repose, **416** (4); substance of, increased by certain foods, **356**, A, ii (*a*); destroyed by intense cold, **894**, **930**; versus breath, *141*

Innocent creature of God, *72*

Insanity and malaria, **228**

Insight into eternal truths, degrees and modes of, *17*; versus intuitional knowledge, *18*; *Appendix 2*

Insomnia, bad for bodily state, **339**; meaning of, **487**

Instinct, **180**, *153*; definition of, *152*, **180**; difference from reason, *152*

Instinctive actions, *153*; character reading, *163* (i)

Intellect, interactions of, *165* (I); definition of, *161* A; relation to corporeal organs, *161*, **A**

Intellectual imagination, *151*

Intemperaments, action on breath, **443**; cause of weakness in, **443**; cause of pain in, **432**; classification of, **38**, **41**; due to retentions, **394**; from matter, are two-fold, **43**; may lead to asthenia, **443**; table of signs of, **493**; urinary characters, *238*; various regimen for, **864**

Interactions between various aspects of soul, *165*

Interests, examples of, *164* (IV)

Interior senses, **176**

Intermissions of pulse, *229*; Chinese prognosis from, *ib.*

Intermittent pulse, **538**

Internal inflammatory masses, treatment of, **1054**

Internal symptoms can only be discussed "specially," **464**

Internal ulceration, treatment of, **1065**

Interrelations between faculties and qualities, **151**

Intertrigo, in infants, **731**

Intimate structure of body always changing, *121*

Intoxication: effect on organs; treatment of, **809**

Intuition, definition of, *161*, F

Intuitive knowledge, scholastic definition of, *161 F*

Invisible elements and visibilia, *74*, *Appendix 2*

Involuntary healing power, *162* (iii)

Inward enlightenment, *13*

Iridescence in urine, **672**

Irregular pulse, **529**, **535-538**, **546**; modern, *229*; Chinese, *229*

Irregularities of pulse, components of, **537**
Irritability due to indigestion, **774**
Itching, dreaming of, denotes plethora of faculties, **499**

J

Jactitation, **455** ; cause, **457**
Jaundice, due to stone, **393** ; not a disease, strictly speaking, *171* ; sign of, in tongue, **479** ; urine in, **613**, **622**
Jelal actions, list of *82*, **490** ; jelal-jemal, **345** (footnote) ; *82*, *126*, *138*, i, *275*
Jerking pulse, **539**
Jili's classification of faculties ; diagram, *155* (iv)
Joannitius' classification of symptoms and signs, *200*
Joint-pains, in autumn, **289** (iii) ; oil-bath for, **413**
Joints, loss of continuity in, prognosis in, **514**
Joint-troubles in the aged, remedy for, **861**
Joy, definition of, **1095** ; effect on pulse, **601** ; a humectant, **417** ; synonyms, *164* (II)
Juveniles, temperament of, versus young adults, **158** ; versus old age, **62**

K

Ka'ak al-'Id, *251* (bun)
Kabāb, **796** (roast meat)
Keen observation of Nature a characteristic of Avicenna, *14*, *292*
Kettle silent, *66*
Kidney, abscess in, **637**
Kidneys nourished by fat of blood, **104**
Knowledge : common to Avicenna and modern medicine, *37* ; perfect, how to reach, **12** ; to be gained from study of urine, *239* ; what it is, and what not, *11*, *Appendix 2*
Kunafah, *251* (vermicelli cake)

L

Labile versus fixed states, *166*
Lactation, duration of, **710** ; rules for, **696-711** ; regimen during, **16**
Large and small cycles, *105*
Large pulse, causes of, **567** ; list of variants, **557**
Lassitude : after exercise, treatment of, **830** ; arefactive, **826** ; ditto, treatment, **833** ; bathing, **836** ; bleeding, **837** ; desiccative, **813**, **826** ; diet, **834**, **838** ; exercise, **835** ; forms of, **427**, **822** ; inflammatory, **825**, **851** ; ditto, treatment, **832** ; in travelling, **885** ; regimen for, **840** ; sign of moist intemperament, **493** ; spontaneous, treatment of, **840** ; tensive, **824**, **831** ; two modes of, **827** ; ulcerose, **823**, **830**. In general, **822**, **434** (5)
Latent disease, **222**
Latin version of Canon has many merits, *38*, but best understood in conjunction with the Arabic, *ib.*
Latitude and climate, **307** (*a*)
Law : of action and passion, *89* ; of attraction in breath and nature, **1113**, of compulsory visibility, *88*, *91*, *95* ; the pivot of the opening and closing operations in Nature, *88*
Laxative foods for old people, **857**
Lead pipes damage the water, **375**
Leanness denotes hot dry temperament, *202*
Leeches : after-treatment of, **1042** ; areas from which they drain blood, **1038** ; characters of, **1037** ; conditions in which they are of value, **1043** ; in water, **385** ; in drinking water, **879** ; procedure of application, **1039** ; removal of, **1041** ; sites of application, **1040**
Leek-green bile, **84**
Leprosy and fish, **795** (2) ; two kinds of, **795**
Lessening of friction, is the object of lymph, **73**
Lethargy, **336-340**, **815**
Liability to illness, regimen for, **869**
Lienteric diarrhœa, **199** (i), **961** ; in autumn, **289** (i)
Life : as viewed by St. Thomas, lines preceding **136**, **161** ; -- breath, concentrated round solar plexus, *257* ; compared to lamp, **681** ; depends on innate heat, **33** (ii) ; definition, *129* (**5**) ; meaning of, *294*, *Appendix 2* ; original source of,

1086 ; principle, *134* ; ditto, breaks up into similar life, *147*, (*b*) ; ditto, cycles of, *107* ; ditto, in relation to vegetative faculties, *142* ; ditto, versus vital faculty, *129* ; spent with sad or glad breath, **1094** ; use of adult, right, *241*
Ligaments, difference between true and false, **116** (5)
Light in summer is intense, **244** ; effect on functions, **112**
Li Ki, *56*, *83*, *196*, **257**
Limbs, how to remedy malformed, **821** ; to strengthen, *ib.*
Limits of range of temperament, **33**
Link between soul, passions, temperament, *110*
Liniments, two kinds, **1015**
Liquorice-stick, for teething, **713**
Lisping goes with liability to gastro-intestinal catarrh, **972**
List : of data to go on for diagnosis of dominance of humours, **500** ; of drugs in the Canon which are still used, *Appendix 3* ; of the four humours, **71** ; of necessaries, **17**, **18** ; of words descriptive of emotions, *164* (II) ; of terms applied to mental faculties, *164*
Literal errors do not vitiate the Canon, *16*
Literary treasures of Arabs, their fate, *4*
Liveliness, meaning of, **492**
Liver : seat of formation of dense humours, **163** ; signs of functional adequacy, **453** ; state of, informed of by urine, **605**, **621**, **626** (1), **658** (1), *238*
Locality : and pulse, **582** ; of residence, effect on body, **318–332**
Locomotion, power of, **184**
Lodgment of atrabilious humour between liver and stomach, **108**
Long pulse, **521**
Loss of continuity, causes of, **428** ; signs of, **513**
Loss of sensation denotes loss of continuity, **513**
Lote tree, **705**
Lovable disposition with equable temperament, **495**
Love, effects on pulse, **601**
Lower limbs, venesection from, **1026**
Low-lying countries, effect of on health, **326**
Lower reason : definition, *159* (ii) ; versus reason, *152*
Low resistance (B.P.), clinical causes of, *231*
Lullaby, **695**, **698**, **712**, *240a*
Lumbago, **824**
Lumbar pain, urine in, **630**
Luminosity of urine, **620**
Luxation of member, signs of, **513** (4)
Lymph, transformation into blood, **73**

M

m, symbol of matter, *56-72*
mfa, and the laws relative thereto, *64*
MF, symbol of human being, *64*
Macrobius on lactation, **696**
Macrocosm and microcosm, *100*
Macroglossia, **199** (ii)
Malady defined, *168* A ; versus symptom, examples, **194**
Malaria cures general paralysis, **228**
Malconformation, **199**
Male sperm, part played by, **679**
Malformations, meaning of, **911**
Man affected by meat he eats ; animals by herbs they eat, **304**
Manner of evacuation, rules for, **934–946**
Maritime countries, effect on inhabitants, **327**
Marshes, effect of, **307** (9)
Marshy water, **371** ; how to make drinkable, **876**
Massage, **749–750** ; for lassitude, **834** ; for old age, **854**, **862** ; for ulcerose lassitude, **830**, **846** ; of infants while washing, **695** ; of the breasts, **705**
Massive build shows cold and moist temperament, *202*
Mass production versus isolated craftsmanship, *49*
Mastery over "fate," *165* (IV)
Material : cause, **13** (i) ; diseases, *274* (diseases of "matter") ; of humours, **106**
Matrix of breath, **1100**

Matter, St. Thomas on, *65*; and form, doctrine of, *56-72*; and form and life, **1089** (note to), *265*; would cease if God stopped *doing*, *83*; used synonymously with humours, **205**; six kinds of: the four humours, gas and water, **208**
Maturation, explanation of, **149**; of abscess, **210**; time of, for evacuation of, **935** (4)
Meals divided into portions, **766**; number in a day, **774**; size of, **765**; their composition, in prescribing regimen, *254*; to be divided in certain people, **776**
Meaning of hot and cold, in regard to drugs, **37**
Mediæval successes not coincidences, but genuine, *33*
Medicaments, four orders or degrees of, **355**; fate of in body, classification, **356**
Medicinal treatment, **910**; four rules for, **911**
Medicine as a career, *46* (i); an art in the strict sense, *44*; as an expiation, *47* (*d*); as an exterior life, *46* (i); as an intellectual pursuit, *46* (i) (*a*); as an interior life, *47* (2); cannot furnish proofs for things in other domains, **16**; definition of, **6**; definition (Joannitius), *45*; highest aim for practising, *48*; imperfect without scholastic philosophy, *22*; pursuit of as devotion to God, *47* (*c*); scope of, as profession, *46*; speculative and practical, **7, 678**
Medicines, potentialities, **354**; selection of, **910**; types of, in treating intemperaments, **493**
Members: covering internal organs, **130**; derived from sperm heal differently to those derived from blood, **128**; derived from humours, **114**; made of heavy elements, **25**; table of, **115**; which comes first, **171**
Membranes, functions of; are insensitive, **116** (8)
Memory, **182**; scholastic definition, *154*; sensuous, *154*; rational, *154*
Menstrual; blood utilised in four directions, **126**; excretion, *240*; flow, regulation of, **820**; fluid, *240*
Menstruation, regulation of, **820**
Mental: anxiety, **455**; environment and regimen, *254*; factor in treatment, **922**; faculties, classification of, *155* (V); ditto, in equable temperament, **494**; lists of terms of, *164*; processes corresponding to natural faculties, *131*; states and pulse, **563**; states and refrigerants, **416** (6)
Mesnavi, earth warp and weft, **21**; heaven is male, **20**; kettle silent, *66*; God abases and exalts, *68*, *83*, *241*
Mess of cooked pomegranate seed, *251*
Metabolic processes as a pageant or procession, *93*
Metaphysics, Catholic definition of, *22*; necessary for medicine, *51* *268*
Metaphysical dance, *99*; ocean, *88*
Metre of pulse, **532–534**, *218-220*
Microscopic structure not co-terminous with C, N, P, S, *96*
Military exercises, **739** (ii)
Milk, cow's, becomes toxic if animal frightened or exhausted, **112**
Milk, first, to be drained, **697**; in dietary for old persons, **855**; of cow affected by its temper, **112**; quality of, changed by emotions, **700**; too scanty, **704**; too thick, **702, 706**; too thin, **703**; unpleasant odour, remedy for, **706**
Milky water, action of, **388**; antidote for, **899**
Mind: kinds of activity of, *161*; list of adjectives pertaining to, *164* (IV); of brutes, *18*; mind-soul-spirit, *129*; of liver-cell, **119**; should be soothed when giving purges, **977**; states of, and breath, **341**; types and the elements, *78*; scholastic definition of, *161*
Mineral baths, action of; list of, **408**
Miraculous: cures, *147* (*e*) (explanation of); healing, *163* (iii) (*c*)
Misquotations and mistranslations account for disrepute of ancients, *6*
Mistletoe-green urine, **626** (2)
Mists and marshes, effect of, **307** (*g*)
Mitigation of after-effects of purgatives, **985**
Modern and mediæval medicine contrasted, *268*, *269*
Modern medicine not free of failures, *35*
Modern scholastic philosophy of paramount importance in medicine, *40*; versus positivism (modern science), *22*
Modern thought as to the three faculties, *129*
Mode of origin of the fluids of the body, **99–113**
Moist: air defined, **250**; atmosphere, effect of, **278**; atmosphere, effect on body, **313**; temperament, degrees of, in organs, **49**; temperament, signs of, from the form, **481**
Moisture: forms of in the body, **49**; necessary to transformative faculty, **137**; purpose of, **22**; = ruṭūbat, which is not synonymous with "humour"
Moles (abortion), due to drinking stagnant water, **380**
Mollificants, **423**

Moments musicales, *121*
Moment, of nascence, *91* ; to choose for evacuation, **935** (4)
Moodiness, *164* (II)
Moods, *164* (ii)
Moonlight, effect of, *186* B (*b*)
Moral causes of disease, *199*
Morbid atrabilious humour, three kinds of, **93**
Mother love, power of, *163*
Movement : as cause of pain, **438** ; in plants, difference from locomotion, *156* ; of breath, *143* ; kinds of, **192** ; of contraction in artery in the pulse, **516** ; abnormal, causes of, **427** See ' Dynamic '
Mountains, effect of living on, **325**
Mousetail pulse, **544**, **567**
Mucoid sediment, **658** (4)
Mural decorations in bath-houses, *199*
Murky air as depressant, **279** ; difference from " dense " air, **279**
Muscles : furnish evidence of temperament, **467–469** ; development of, shows moist temperament, **467**
Music, **531** ; effect on pulse and bodily functions, *219* ; for relief of pain, **1084** ; kinds of, *219* ; quotations *re*, *219* ; taste for, depends on breath, *139*
Musical instruments and the pulse, **532**
Mutations, incidental, in atmosphere, **305–307** ; of the atmosphere, **242** *sqq.*
Mutual interaction and repulsion, **483**
Myalgia, **824**
Mystical insight, *13* ; view of chemistry of life, *93*, *94*

N

Names of disease, basis of, **223**
Narcotics, **435**
Natural : breath a phase, *148* ; cure of disease, **920** ; faculties are four, **146** ; classification of ditto, **142**, *131* ; ditto defined, *129* (4) ; pulse, **551** ; term of life, **61**
Nature : definition of, **56**, *58* ; of bacterial action, *203* ; of human being, true conception of, fundamental to modern medicine, *23* ; what it is, **56** ; meaning of, **551**
Nature = the natural world ; must not be overlooked, *293*, *294*, *Appendix 2* ; like a palace, *Appendix 2*
Nauseating aperients, rules regarding, **976**
Nauseative indigestion, **762**
Negative definitions of " human nature," *272*
Nerve as source of power of a membrane, **129**
Nerves : description of, **116** (3) ; dryness of, **839** (iii)
Neuritis, ice water bad for, **376**
Neurotic, meaning of, in terms of breath, *148*
Nichomachus' disease, **199** (ii)
Night : terrors, **718** ; travelling, **882** ; urine, normal quantity of, **666**
Nile water, **370**
Nitrogen, part played in body, *91*
Nitrous baths, use of, **408**
Nobility of human body shown in its temperament, *109*
Non-commendable waters, **377**
Non-excrementitious fluids, four varieties, **69** (*a*)
Normal blood, description of, **72**
Normal functions, knowledge of, necessary to diagnosis, **456**
Normal stool, characters of, **676**
Northerly countries, effect of living in, **328**
Northern climate, effect on women, **328**
Notes of the individual, *164*, *272* (2)
Notions, three, for scholastic medicine, *269*
Noxious agent, as cause of change of " state," *167* ; may be harmless externally, why, **399**
Nubecula, significance of, **662**
Number of meals a day, **774** ; of members which are diseased together, **225**
Nutriment changed into blood, **102** ; versus medicine and poison, **356**.
Nutrition, the faculties subserving, **146**, *sqq.*
Nutritive faculty, definition of, **143** ; seat of, **139**
Nutritive value of food, *195* (3)

O

Obesity, how to reduce, **872** ; regimen for, *ib.* ; urine in, **657**

Objective signs of plethora, **495**

Object of life not to alter character, *64* ; of this treatise, *40*

Obsession, *162* (I)

Obstruction : of various humours in modern language, **503** ; of channels, agents causing, **420** ; signs of, **502**, *sqq.* ; arterial, worse than venous, **1046** ; associated with intemperament, treatment of, **929** ; due to excess of food, **358** ; due to imperfect digestion in the blood-vessels, **109** ; in old persons, treatment of, **961** ; removed by bath after meal, **406** ; treatment of, **1045**. *274–279*

Occult : definition of, *162* (I) ; phenomena, *162* ; ditto, emotional basis, *162* (IV) ; powers, *162* (I), *163* ; ditto, basis of in human beings, *162* (VI) ; ditto, in man, as a criterion of sainthood, *162* (V) ; ditto, natural to some persons, *ib.*

Occupation a guide to choice of evacuant method, **934** (11) ; and regimen, *254*

Odours, abnormal, a sign of disease, **454** (8)

Œdema = plethora of lymphatics, **442**

Offspring, character of, and maternal impression, **345** ; kind of, and emotions, **345**

Oil-baths, value of, **413**

Old age : diet, **855**, **857** ; errors of diet, remedy, **855** ; exercise in, **854**, **863** ; massage in, **854**, **862** ; mental state, depicted, *241* ; obstructions in, treatment of, **861** ; purgation for, **859** ; regimen for, **854** ; wine for, **860**

Oleaginous urine (three kinds), **626** (2)

Oliguria, significance of, **667**

Opacity of urine, persistent, meaning of, **631**

Opaque = thick, urine, **631**

Opening and closing operations of Nature, *88*

Opening up channels, agents which effect, **421**

Operation of vegetative soul (St. Thomas' account), *130*

Opium, use of for pain, **1075**

Oppilations : see Obstructions, **502**, *sqq.*

Orderly pulse, **530**

Order of severity of causes of loss of continuity, **514**

Organs derived from blood, **125** ; derived from both male and female sperm, **124** ; derived from semen, **125** ; differ in temperament, **35** ; functional capacity of, *82* ; round stomach like fire round a cauldron, **100** ; transcend anatomy, *25*

Origin of all sickness, **759** ; of human being, **679**

Orobeal sediment of urine, **658** (i)

Ostalgia, **825**

Outward form clue to character, and functional capacities, *25*

Over-repletion, causes of, **442** ; with food, treatment, **784**

Oxidative processes retarded = choking of breath, **442**

Oxidized atrabilious humour, nature of, **91** ; bile, two types, **84**

Oxus, water of, **360**

Oxymel syrup, how to tell from urine, **674**

P

Pæony, action of, **350**

Pain, alleviation of, **435** ; character of, in loss of continuity, **513** ; definition of, **432** ; discussion, **432** ; due to gaseous distension, **440**, **504** ; effect on body, **436** ; effect on respiratory organs and pulse, **561-599** ; how it causes disease, **195** (*c*) (note) ; impairs vitality, *170* ; internal medication for, **1079** ; nature of, theory of, **432**, **433** ; over liver after purgation, **987** ; relief of, **1073** ; ditto, by cupping, **1033** (vi); ditto, by music, **1084** ; requires treatment, **921** ; selection of remedies for, **1078** ; significance of, **458** (3) ; treatment according to site of cause, **1076**, **1077** ; types of, list of, **434** ; versus disease, **195** (*b*)

Palatability of food, **773**

Palpation to distinguish gaseous from other swellings, **504**

Pancakes, *251* ; urinary sediment resembling, **662**

Papular swellings, varieties of, **220**

Paresis, **199** (iv)

Parturition difficult in northern climates, **328**

Passions : affect the constitution, **700** ; the milk, **700** ; and breath, **1093**, subduing, **864**

Passive congestion, **442**

Pathological: classification of disease, advantages, *173*; retention of excreta, causes, **1044**
Perception, localization, chart to, *161* (B)
Perceptive faculty, **174**
Percussion distinguishes between ascites and tympanites, **504**
Perfumes, to restore cases of exhaustion, **991**, during venesection, **1027**
Periodic changes in state of atmosphere, **277**
Periods of life, four, **51**
Personality, explanation of, *141*, *281*
Pestilential air, **308**; how produced, **311**; regimen in, **877**
Phantasies, effect on offspring, **345**
Phantasy, **178**; effect on bodily state, **346**
Pharmaceutics, **905**
Pharmacology, modern versus ancient, *271*
Phases of disease, **222**; of hot swellings, **210**
Phenomena of outer world reveal the inner, *100*
Philosophy, Catholic definition of, *22*
Phlegm in stomach in old people, **859**
Phlegmatic constitution, diet for, **766**; diseases of, in spring, **282**
Phlegmon, definition, **209**
Phosphorus, part played in body, *92*
Physical geography and climate, **307** (*c*)
Physician must be healthy, to detect patient's temperament, **465** (i)
Physiology is anatomy in motion, *142*; is rationalistic (quotation to prove), *24*
Physique a guide to treatment, **934** (5)
Picture of movement in a whole tissue, *97*, *269* (3)
Pictures and paintings in bath houses, *199*
Pills, administration of, rules, **998**
"Pitching," **871**
Pitch plaster a remedy for leanness, **871**
Pivot of function, changes of, *92*
Place of residence and regimen, *254*
Plagues, atmosphere during, regimen *re*, **877**
Planetary cycles, *138*; influences, *108*, *186* (B ii)
Planets and mind, *186* (B) (ii)
Plastic faculty, **145**
Platonic view of nature of human beings, *24* (i)
Pleasurable sensations, theory of, **437**
Plethora = passive congestion; a guide to evacuation, **934**; cause of, **442**; evacuant treatment not always needed, **951**; in the channels of the body, **497**, *273*; not necessarily treated by evacuation, **924**, **951**; of faculties, **499**; "overfulness of the vessels," **564**; signs of, **497**
Pleurisy, essential symptoms of, **454** (4)
Pneumonia, pulse in, **454**
Poetry, Arabic, and musical time, *218*, *219*
Poisons: classification of, modern, *194*; of toxicity, *194*; definition of, **355** (4); to kidney, but not poisonous *per se*, *194*
Polo, **739**
Polyuria, **665**; critical, **616** (*d*)
Positive and negative ether, *82*
Positivism, objections to, *21*; refutation of by modern scholasticism, *22*; quoted, *21*
Posture and pulse, *225*; as evidence of disease, **454** (5), **455**; in sleep, **819**
Potential action of medicines, **354**; of food, **352**
Potentiality and actuality, *61*
Potentiality of food, meaning of, **352**; versus disposition (table), **1094**
Poulticing for pain, **1082**
Power accruing from delight, **1096**
Practical medicine, meaning of term, **678**
Practical understanding, defined, *159* (III)
Pranas, *136*
Prattling to the infant, **698**
Precautions: about baths, in relation to meals, **754**; about cold bathing, **758**; about drinking-water when travelling, **898-902**; about exercise, **743**, **745**; about feeling the pulse, **518**, *206*; about purgation, **974**; about resolving thick humours, **1046**
Predisposition, *233*

Pregnancy and emesis, **999** ; pulse in, **597**, *236* ; urine in, **672** ; urinary turbidity in, **639**

Preliminary treatment to purgation and emesis, **973** ; to venesection, **1027**

Premature summer, effect on incidence of disease, **270** ; winter, ditto, **270**

Pre-modern thought in terminology, *129*

Preternatural impressions, atmospheric, **308-313**

Prevailing winds and residence, **332**

Prevention of apposition of parts, **425**

Primary fluids of the body, **69**

Primitive, or primary causes, **231**

Principal organs, list of, **123**

Principles = " theory ", *19* ; four, applicable to drawing humours out of members, **913**

Procedure in emesis, **1001**

Prognosis from dark-coloured urine, **617** ; intermissions of pulse, *229* ; opaque (thick) urine, **532** ; red urine, **625**, white urine, **625**

Prognosis in cases of loss of continuity, **514**

Prognostic signs, definition, **452**

Programme of the Canon, **3, 4**

Progress, meaning of term, discussed, *267* ; is relative, *Appendix* I

Prolapse of anus in infants, **727**

Proof that arterial wall itself contracts and expands, **580**

Property of a drug, wherein it lies, **1122**

Prophylactic evacuation, **953**

Prophylaxis against spring diseases, **283**

Protection from icy cold, **893**

Provisions to take when travelling to icy countries, **892**

Pruritus in infants, **731**

Psychical faculties, **174** (see " sensitive life ")

Psychic power, *162* (7), *163* (iii)

Psychology, Catholic definition of, *22*

Puberty benefited by spring, **267** ; definition, **52**

Puerperal convulsions, urine in, *238*, ; eclampsia, urine in, **617** ; tetanus in northern countries, **328**

Puerperium, urine in, **672**

Puffiness, varieties of, **211**

Pulmonary abscess, urine in, **626** (4)

Pulse, **515** onwards ; knowledge of circulation not necessary for, **515** ; accurately understood in ancient times, **515** ; reveals length of life (Chinese teaching), *112* ; classification of, **519**, **520-538**, **539-550** ; definition of (Avicenna, and modern), **515** ; diagnosis from (Chinese), *204* ; diurnal variations of, *225* ; duration of cycle, **524**

Pulse : effect of : age and sex, **574**, *234* ; bathing, **596** ; convalescence, *237* ; drinking water, **586** ; drugs, *225* ; emotions, **601**, *225* ; exercise, **588**, **593**, *225* ; food, *225* ; food and drink, **583** ; high resistance, *232* ; inflammatory swelling, **599** ; locality, **582** ; low resistance, *231* ; pain, **598** ; pregnancy, **597** ; preternatural agents, **602** ; respiratory movements, *225* ; satiety or hunger, **518** (4) ; season, **587**, *235* ; sleep, **587**, **588** ; time of day, *225* ; various temperaments, **579** ; wine, **584**

Pulse : feeling the, precautions to take, **518**, *206*, *207*, *209* ; repose of body and mind essential, *209*, *283* ; missed beats, *212* ; musical character of, **531** ; modern, definition of, **515** ; rate versus respiration rate, *230* ; rate increased (modern facts), *225* ; specially quick, *227* ; slow, *228* ; minute classification of (Chinese ; Giles), *204* ; of both sides differ apart from anatomy, *206* ; technique in feeling **518** ; ten groups of features, **519** ; tsang, fu, pyau, li, and tau, *209*

Pulse-types : bounding, **540** ; broad, **558** ; chord-like, **549** ; creeping, **541** ; deep, *215* ; dicrotic, **546** ; elevated, *215* ; extraordinary variety of (Broadbent), *209* ; — because human body not a machine, but ever-changing, *217* ; factors concerned in, **552** ; falling, **547**, **568** ; feeble, **561** ; formicant, **542**, **572** ; gazelle, **539** ; hard, **562** ; harsh, **543**, **565** ; hectic, *224* ; hurried, **559** ; irregular, **564** ; jerking, **539** ; large, **554** ; mousetail, **544**, **567** ; natural, **551** ; recurrent, **545** ; recurrent mousetail, **567** ; renal, *237* ; serrate, **543**, **565** ; short, *215* ; sluggish, **560** ; soft, **563** ; spasmodic, **548**, **569** ; tabulated, *215* ; tense, **562**, **569** ; thrilling, **548**, **570** ; undulatory, **540**, **571** ; visible, *223*

Pulse, why felt at wrist, **517**

Pungent things, **433**

Pure water, characters of (Buddhist), **366**

Purgation: adjuvants to, **977**; and bathing, **973**; and sleep, **975**; better than emesis in fevers, **961**; for young persons of hot temperament, **865**; general rules, **947**, *sqq.*; in elderly persons, **859**; in people with hot temperament, **977**; necessary in youth, **57**; of morbid humours, theory of, **945**; rules relative to, **970**; to attract matter from upper parts of body, **945**; undesirable after-effects, **987**; when undesirable, **958-964**
Purgatives: choice of according to temperament, **994**; according to humour to be evacuated, **954**; explanation of action of, **996**; failure of action, **992**; ditto, causes of, **984**; operate on intravascular humours, **966**; preferably avoided by taking sufficient exercise instead, **737**; proper time for taking, **988**; selective action on humours, **984**
Purgative spurges, how to mitigate, **982**
Purge may act as emetic also, **959**
Purification of drinking-water, when travelling, **898**
Purification of water, **368**; by distillation, **898**
Purposes of bilious humour, **82**
Pus in fæces, **675** (3); in urine, distinction from simulacra, **637, 655**
Pustules denote bad humours emerging, **207**
Putrefaction, explanation of, **485**; in marshy water, **377**
Putrefactive: breakdown of body, **680**; of matters in urine, **656**; in lymph, **73**; disorders, precursors of, **497**; processes as calefacients, **415** (v)
Putrescence is an extraneous source of heat, **358**; from excess of food, **358**; in blood, **72**; in serous humour, **76**; in rain water, **373, 374**
Putrid odour in urine, **648**
Pyuria, diagnosis of, sediment of, **637, 655**

Q

Qaḍā and qadr, *82*, *106*, *275*
Quantity of fæces, **675** (i); of food at a meal, **765**; of daily urine, **665**; of urine, variation of, significance of, **666**
Quality: of air, changes of, effect of, **312**; of atmosphere, effect of changes of, **278**; of body, agents which alter, **415-430**; of food, influence of, **347** (*a*); of spring air, **257**
Quick-tempered persons and the bilious humour, **794** (and footnote)

R

Racial temperament, **33** (iii)
Rain water, properties of, **372**
Rainy: and dry seasons, effect on body, **296-301, 273**; weather and the formation of serous humour swellings, **215**
Rancour, effect on imagination and blood-state, **1118**
Rapidity: of gestures, significance of, **490**; of food-passage through intestine not grasped till this century, *32* (*b*)
Rare things excite undue notice, **1129**
Rarefaction of skin, causes of, **839**
Rational: faculty, table showing relations, *129*; imagination, *151*; life, defined, *159*
Reaction of body to cold air in spring and autumn, **258**
Reading: aloud as an exercise, **742**; the Koran according to seven modes, *27*
Reality beneath unceasing change, *43*
Reasons for choosing Avicenna for the treatise, *40*; for different classifications of faculties, *155* (note)
Reasoning: faculty, interactions of, *165* (II); definition, *161* (E); list of sub-faculties, *161* (E)
Receptacles, **911** (ii)
Receiving and giving faculty, **117**
Recurrent pulse, **538, 545**
Red cheek bones denote lung disease, **454** (9), **455**
Red hair denotes equable temperament, **472**
Red, shades of, **611**
Reducing diet, **907**
Red urine in cold maladies, significance, **621**; prognosis, **625**
Refrigerants, **416**
Regeneration of members, **128**
Regimen: according to the seasons, **873** and **876**; defined, **905**; discussion of full programme, *254*; for congenitally hot intemperament, **864**; for defective

temperament, **853, 864**; for elderly people, **854**; for infants up to dentition, **712**; up to adolescence, **733-735**; for old age, **854-863**; for travellers, **879**; in lassitude, **828**; of wet-nurse (diet, exercise, personal), **708**; prescribing, *254*; *re* food and drink, **759-814**
Regiminal treatment, *296*
Regular pulse, **529, 535**
Reinforcements to treatment, **928-930**
Relapse, foretold from urine, **630**; of spontaneous lassitude, treatment of, **849**
Relation between autumn and periods of life, **291**; between faculty and duration of muscular contraction, **159**; between "form" and change, *86*; between qualities and faculties, **154**; between season and temperament, **261-273**; between soul-activity and law of conservation of energy, *64*; between structure and function, *122*; of breath to anatomical organs, *145*; of character of hair to age, **475**; of elements to natural faculties, *131*; of periods of life to winter, **295**; of organs and tissues, necessary to know, **456**; to meals, baths, **406**
Relaxing effect of summer, **285**
Religion does not hinder progress in knowledge, *9*
Remedies for inebriety, **813**; which soothe pain, **1074**
Remote symptoms, distinction from immediate, **462**
Renal: calculus, urine in, **617**; disease, red urine in, prognosis, **625**; disease, urinary sediment in, **658** (i); insufficiency, urine in, **628**
Repair: of damaged muscles, **128**
Repercussives for internal inflammatory masses, **1054**; use of, **1050**
Repletion as cause of susceptibility to illness, **869**; in northerly countries, **328**
Repose, effect of on body, **335**; undue, as cause of repletion, **442**
Reproduction, faculties subserving, **139, 145**
Researches apt to be futile if philosophy faulty, *22*; directed to the curious rather than the everyday, **1127**; still hindered by prejudices, *Appendix 1*
Residence, how to choose, **332**
Resolvent medicines, cautions necessary regarding, **915**
Response to heat and cold, **482**
Rest strengthens the serous humour, **112**
Restlessness produced by purgative drugs, **964**
Restorative exercises, **829, 832, 840**; treatment, **833**
Retained menses, urine in, **616** (*d*)
Retention as sign of disease, **458**; of wastes, causes of, **393**;
Retentive faculty, **148**; same as memory, **182**
Retributive or expiative causes, *201*
Retropharyngeal abscess, **729**
Revelations and visions, *162* (iii)
Reward for medicine, *46* (i) (*b*); *48*; kind of, which is certain, *48*
Rhythm, *84*
Riding, when best not, **883**
Right use of adult life, *241*
Rigors, cause of, **427**
Rob, use of, antidotal to impure waters, **720, 902**
Rocking of cradle, **698**; to throw yang-yin into rhythm, *104*; ill-effects, **709**
Rocky exposed places, effect of residence in, **323**
Romance of Nature, *292*, *Appendix 2*
Roughness of body, agents causing, **422**
Rough skin denotes dominance of atrabilious humour, **500**
Rules, five, in procuring evacuation, **935**; four, for understanding nature of a member, **911-914**; for selection of wet-nurse, **699**; for treating children, **733**; *re* bathing, **403-407**; *re* drawing morbid matter from part to part, **936-939**; *re* influence of seasonal change on temperament and vice versa, **261-273**; *re* procuring emesis, etc., **947-964**, etc.
Rupture: of intestines, signs of, **513** (5); of vessels from repletion, **497**

S

Sadness belongs to ether element, *78*; see table in *160* (iii)
Saffron helps cardiac drugs, **912**
Saline baths, use of, **408**
Salt water, action on body, **386**
Salty water, antidote for, **899**; to purify for drinking, **898**
Salty serous humour, description of, **75**; compared with salty waters, *ib.*

Sandbaths, action, **410**
Sanguineous humour: described, **71**, **72**; signs of predominance, **500**; dreams in, *ib.*; relation to rational and vegetative faculties, etc., *ib.*
Satori, mystical insight, *15*
Sawik, *251* ("meal-sack")
Scammony, use of, **926**, **954**
Scantiness of milk, diet to rectify, **704**
Scars, disfiguring, **221** (2, iv); from ulcers, **426**
Scheme of study of patient (modern and ancient), *270*; of position of the "worlds," *54*
Scholastic: classification of faculties, diagram, *155* (IV); definitions, *129*; medicine, *271*; nomenclature considered in studying the Latin Canon, *39*; philosophy alone refutes errors, *28*, *50*; philosophy often caricatured by its opponents, *40*; to be expanded and not merely expounded, *40*; view of human nature, formula, *150*. See "Thomistic"
Science is incomplete knowledge, *22*
Scientific view of human nature, *24* (ii)
Scirrhus, **458** (4)
Scorpion—serpent—human, **37**
Sea-bathing, *245*
Sea: effect of, on climate, **307** (*d*); sea-sandbaths, value of, **412**
Sea-sickness, all about, *256*; to prevent, **904**; persistent, **904**; precautionary measures, simple, **904**
Sea-voyages, regimen for, **903**
Seasons: abnormal quality of, *186*; and intemperament, **493**; and pulse, **581**,*235* and blood, **284**; change of, determines kind of diseases, **259**; change of influence on body, **261–273**, *174*; characteristics, effect of, **280–295**; diet according to, **760**, **764**; effect on atmosphere, **245**, **247**; effect of sun and moon on, **244**; exercise according to, **746**; food according to, in old persons, **857**; influence on body, **242**; medical definition of, **242**; modification of treatment according to, **922**; represented in the four rooms of the Hammam, *198*; strong, and weak: summer, winter—spring, autumn, **242**; temperament of, **242**, *sqq.*
Seasonal cycles and bacteria, *187*; effect on body, **296–301**; on pulse, **581**; irregularities (according to Chinese), *108*
Secondary fluids, **69**
Sediment of urine defined, **652**; position of, **662**; signs derived from, **652**
Selection of medicines, **910**
Selective action of purgatives on humours, **984**
Self-culture and ethereal endowment, *108*
Senescence, **51**
Senility, **51**; likes summer, **284**
Sensation in tubular members, **132**
Sensitive faculties = psychical faculties.[163] See **174**
Sensitive life, **174**; chart of, *159* (II)
Sensitiveness to good opinion, a sign of hot and dry temperament, **492**
Sensuous imagination, *151*
Sepsis common in spring, **298**
Septicæmia, urine in, **621**
Septic: changes in humours, effect of, on urine, *238*; conditions due to retention, **394**
Serous humour: dreams due to, **500**; appetite in, **500**; aspect, *ib.*; foods which increase, *195* (3); description of normal, **73**; forms of (table), **74**; produced by marshy waters, **378**; signs of predominance, **500**; faculties when dominant, **500**; why it preponderates in body with age, **60**
Sero-atrabilious humour, **94**
Serrate pulse, **543**
Severity of illness as factor in treatment, **916**
Sex and pulse, **574**, *234*; variation of urine according to, **671**
Shaghal, *264*
Shampooing, **749**
Sheep, urine of, **673**
Shiva-shakti, *138* (i)
Shivering, **455**; causes of, **427**
Short fingers denote small liver, **454** (5); pulse, **521**; stature with massive jaws, denotes inequable temperament, **496**
Shower-bath, use of, **414**; value of, **414**; douching head, **724**; with herbs, **732**: also **817**, **894**
Shrivelling of skin, **833**

Sicbaj, a sour minced flesh-meat, *251*
Sickness, definition of, *168* B (i)
Sight, faculty of, **175**
Signs indicating that purgation is complete, **990**; of air being bad, **276**; of good health, **10**, *240*; of internal inflammation and abscess, **509**; of liver disorder, **478**; of spleen disorder, **478**; produced by inflammation moving up or down, **512**; remaining after bursting of abscess, **510**; that emesis has benefited, **1000**; versus symptom, **195** (*a*)
Simooms, **307** (*e*), **887**
Simple: bodies, definition of, **19**; disorders, dual in character, **197**; intemperaments, list of, **39**; members, **116**; pulses, **521**
Singing exercises, **821**
Siriasis, **719**
Six canons of diagnosis by internal symptoms: heading to **452**
Skeletal system the instrument of normal life, *156*; expresses character of nervous system, *164* (IV)
Skin diseases in autumn, **289** (ii); in infants, **731**; induration of, causes of, **839**; rarefaction and tumefaction of, **839**
Sleep, **336-340**, **815**; after food, **778**; and fasting when travelling, **880**; and purgation, **975**; and wakefulness as signs of temperamental state, **487**; best time for, *193*, **818**; causes of, **815**; conditions to be observed regarding, **818**; during day is bad, **817**; effect on body, **336**, **337**; four times for, **818**; functions during, **489**; how to procure, **817**; interrupted, **817**; is calefacient, **415**; not absolutely necessary, **489**; physiological effects of, **816**; posture in, **819**; pulse during, **587**; purpose of, **489**; rules regarding, **817**, *254*; seven actions of, **337**; time of, after food, effect on pulse, **589–591**; **587**, **817**
Sleepiness, meaning of, **487**; of infant due to overfeeding, **709**; sign of moist intemperament, **493**; after meals, **765**; quarters of infant, **693**; when travelling, **880**
Sleeplessness: and pulse, *233*; due to joy, **815**
Sleepy sickness, and pulse, **563**
Slender pulse, **522**
Sluggish pulse, causes of, **560**
Smell, sense of, **175**; see Odour
Sneezing, **455**; constant, in infants, **723**
Snoring, in infants, **723**
Snowclad places, as residence, **325**
Snow water, **376**
Softness of feel of patient, **466**
Soft pulse, causes of, **563**; water, **374**
Soil, as guide to choice of residence, **332**; and bacterial growth, *188*; effect of, on climate, **307** f.; effect on waters, *ib.*; kinds of, *ib.*; nature of, *188*; various, effect of, **318**
Solar heat is material, *185*
Solution of continuity, **198** (3); in various members, **200**
Somnolence, undue, imprisons innate heat, **340**
Song of the Sun, *55*
Sordes a form of excretion, **111**
Sorrow and grief, **1102**
Sorrow, synonyms, *164* (II)
Soul: a bundle of life, *134*; and light, *77*; cannot have "location," *22*; diverse meanings of term, **167**; —mind—spirit, *129*; most like light (Averrhoes), *77*; the decree of Allah, **56**; versus body, *130*; ditto, Scholastic view, *135*; versus breath, *136*
Sounds, abnormal, sign of disease, **454** (7); and elements, **175**
Source of atrabilious humour, **80**; of good blood, **105**; of images of the imagination, *151*; infant's fat, **127**; of innate heat in juveniles, **55**; of joy and gladness (examples), **1108**; of increase of gladness, **1112**, **1113**
Soured milk, **795**
Sour serous humour, in two forms, **79**; sour water, antidote for, **899**
Southerly countries, effect of residence in, **329**; effect on women, **329**; and men, *ib.*; water of, **329**
Spasm, cause, **427**
Spasmodic pulse, **548**, **569**; after inflammation in sensitive parts, **600** (5)
Special symptoms, significance of, **458** (6)
Specific: capacity of creatures, **1087**; property, definition, **1122**; erroneous ideas as to, **1126**, **1127**; versus nature, **1122**; what it is, **1125**

Speculative understanding defined, *159* (III)
Sperm discussed, **125** ; male and female, **145**, **679**
Spheres, position of elemental, *54*
Sphygmology, **515** ; Ayurvedic, *214* ; Chinese, discussed, *208* ; esoteric, *209*
Spirit : *134* ; meaning of term, *136* ; as used by Paracelsus, *77* ; versus soul and mind, *129*
Spleen, abscess in, **637** ; atrabilious humour related to, **88**
Splenic disorders liable if atrabilious humour dominant, **500**
Spontaneous lassitude, tensive, causes of, **850** ; treatment of, **840**
Sprains, treatment of, **1071**
Spraying, **1016**
Spring : air contrasted with winter air, **257** ; air, why moist, **248**, **249** ; and pulse, **581** ; days may be summer-like, **260** ; changes produced in body, **281** ; open-air bathing in, **757** ; regimen for, **873** ; temperament of, **243** ; -time, defined, **242** ; water, **376**
Sprinkling remedies over infants' head, **715**, **724**
Sputum, *240* ; is the humour forced out of the lung, *ib.*
Squamous urinary sediment, **658** (i)
Stabbing pain, **434** (**12**)
Stability of form in changing physiology, *124*
Stages of disease, **222** ; treatment depends on, **917**
Stagnant air, bad effect of, *181* ; water, antidote for, **899** ; effect on old people, **381** ; on stomach, **382** ; on women, **380** ; purification of, **365**, **378**, **899**
Stars and disease, *183*
States of human body, three, **196**, **452**
States of mind in hot and cold temperaments, **492**
Stern character, significance of, **492**
Stoddart's classification of faculties, *155* (V)
Stomach : abscess in, **637** ; *holds* food, *247* ; injured by stagnant water, **382** ; the house of disease, **759**
Stomatitis, aphthous, **720**
Stout persons, rules *re* meals, **777**
Straight hair, sign of cold moist temperament, **471**
Straining water through cloth before drinking, **902**
Strength of a member, assessment of, **914**
Strength of one organ entails deficiency of another, *126*
Strengthening the members, method, **821**
Stretching, **455** ; and yawning, **829**
Stricture of œsophagus, **199** (i)
Strong members expel waste into weak, **135**
Strong pulse, **523** ; causes of, **562** ; versus large pulse and hard pulse, **516**
Structure : and function, inter-relations, *122* ; of a member, must be learnt, **911** ; of sediment in urine, **652** ; related to phase of metabolism, *95*, *273*
Strumous swellings, **212**
Stupefacients, **1075** ; rules in administration, **1080**
Styptics, effect of, **1044** (iii)
Subdivision of compound intemperaments, **41**
Subheadings with which medicine deals, **15**
Subject-matter of medicine, **11**
Sublunary world, position of, *54*
Substance : defined, *58* ; of air, signs of goodness, **274** ; of breath is water-vapour, **237** ; ditto, effect of sleep on, **337** ; ditto, superfluities of, **239** ; of food, influence of, **347** (*c*) ; of urine versus colour, **632**
Substantial change, *67* ; causes of, *71* ; of nutritious medicaments, **356** (A) (ii) (*a*)
Suckling, rules, *re* **696-713**
Sufic classification of faculties, *155* (iii) ; doctrine of contraries illustrated by, **1057**
Sulphur baths, use of, effect of, **408**
Summer : definition of, **242** ; and pulse, **581** ; disease due to flies, *182* ; effect of on body, **284-286** ; effect on atmosphere, **245** ; heat ascribed to Hell, quotation from Nights, **255** ; proper meals for, **796** ; purgation in, dangerous, **978** ; regimen for, **874**
Sun : baths, **411** ; effect on climate, **306**, *185* ; sun-power, *190* ; sun-stroke, **888**
Superfluities, **200** (i), **456** (ii) ; see also " Toxic substances " ; are effete matter, **200** (i) ; of substance of breath, **239** ; visibly separated off as hair, nails, teeth, *123* (*c*) ; what they are, **68**, **150** ; see also diagram in *278* ; see also " excrementitious fluids "

Supernatural: agencies acting on human beings, *162* (ii), (iii); life, in Chart, *159*; meaning of in Catholic philosophy, *162* (iii); proper meaning of, *115*
Susceptibility to disease, regimen to correct, **869**
Swallowing, mechanism of, **186**
Sweat, *240*; as an excretion, *ib.*; examination of, **844**; and sleep, **337** (5)
Sweating sickness, **229** (D)
Sweetish odour of urine, **647**
Sweets after food, bad, **782**
Sweet wine for old people (to be avoided), **860**
Swellings: a "composite" disease, **205**; arising from serous humour, **215**; atrabilious, **212**; cancerous, **213**; classification of, **208**; cold, **211**; difference from induration, **213**; gaseous, **219**; glandular, **212**; hot, **210**; papular, **220**; site, **206**; special names, **209**; strumous, **212**; watery, **218**
Swooning pulse, **567**; in inflammation, **600** (5)
Symptoms: as a cause of disease, **195** (*c*); of health and sickness, **12**; and signs, difference, **195** (*a*); definition of, **12, 193,** *169*; due to late meal, **775**; essential to the illness, **454** (4); list of, *201*; may *be* a disease, **195** (*d*); of internal disease, six classes, **457**; premonitory of disease (table), **878**; terminal, **454**; versus disease, as shadow to object, **195** (*a*); versus malady and cause, examples, **194**
Synchronism of dancers, cause of, *107*
Syncope: and emotion, **341**; fatal, in cases of injury to sensitive members, **514**; from hot bath, **407**; from purgation, and its remedy, **991**; from severe pain, **514**; from venesection, **1027** (G)
Synonyms: relating to the natural faculties, *131*; between the names of pulse-types in Arabic, Latin, and Chinese, *213*; table of, *215*

T

Table of digestive products, **103**; of members, **115**; of terms applied to dietetics, *252*; of names of pulses, *215*
Tachycardia, **564**
Talents, classification of, *164* (V); list of, *ib.*; meaning of, **492**
Tallness and short fingers together denote inequable temperament, **496**
Taoist eye = mystical insight into Nature, applied to clinical diagnosis, *281*
Taste, sense of, **175**
Technique of venesection, **1027**
Teething, measures to adopt during, **713**; troubles mostly digestive, **715**
Teleological view of structure, *122*
Telepathy, *162* (I), *163* (II)
Telephic ulcer, **223**
Temper explained, *139*
Temperament: a guide to treatment, **934**; knowledge of, necessary, **911**; and character, **865**; as applied to medicine, **37**; changed by nutriment, **356** (A) (i) (*a*); cold and dry, regimen for, **868**; congenital versus acquired, **467**; definition of, **26, 27**; diagram of, *139*; disorders of, treatment of, **925-933**; effect on, of undue evacuation, **396**; equable, eight varieties of, **32**; hot and moist, regimen for, **867**; innate versus acquired, **492**; in regard to geographical position, **64**; in regard to sex, **63**; is noted in matter-disease, **205**; of food, bearing of, **348**; of juveniles, **155**; of the decrepit, **82**; of the several members, **45-50**; of torrid zone inhabitants, **34**; one single thing, emerging from components, **348**; relation of breath to, *139*; variations in different organs, **33** (vii); versus occupation, **65**
Temperamental disorder, **198**; types, *164* (iii)
Temperaments as explaining humoral formula, **107** (iii); belonging to age, sex, etc., **51**; classification of, **30**
Temperature, variations of, seasonal and daily, effect on body, **261-273**
Tendons, **116** (4)
Tense pulse, **562, 569**
Tensive lassitude, causes of, **850**; treatment, **824, 831**
Tenuous foods, **789**; overoxidize the blood, **759**
Tepid water, action of, **390**; as drink, use of, **799**
Term of life, is allotted, **686**
Terminology of dietetics, *252*
Terrestrial factors on climate, **307**
Tests for purity of human milk, **701**; of water, **367**

Tetanus and teething, **716**

Texture of members, **131**; of urine, defined, **606**

Theories about the "breath," **173**; about relative likeness and difference, **483**; about change of quality, in regard to the atmosphere, **248**, **249**; scope of, in medicine, **678**

Theory versus practice, scope of each, **7-9**

Thermal baths, rules regarding use of, **409**

Thermal waters, bathing in, effect on pulse, **596**

Thick milk, diet to rectify, **702**; other measures, **706**

Thick pulse, **522**; skin, **839** (ii)

Thin milk, diet to rectify, **703**

Things of every-day importance, **1127**

Third digestion, **109**; third state of health, **196**

Thirst, precautions regarding, **885**; how to avoid, when travelling, *ib.*

Thirst, true and false, **798**; various causes of, **990**

Thomistic: account of human nature, *25*; basis essential to medicine, *22*, *40*, *271*; science perceives more than modern science, *70*. See also "Scholastic"

Thought: definition of, *161* (D); mechanism of, *ib.*; — reading, *162* (i), *163* (ii)

Threads in urine, **644**

Three: groups of causes, **231**; powers of soul, *130*; states of body, **452**; steps in change, *69*

Thrilling pulse, **548**, **570**; meaning of, **570**

Throbbing pain, cause of, **434** (15)

Thrush, **720**

Time-factor: in aspects of life, *101*; in digestion, **796**, **233**, *101*; in going to stool, **675** (5); in relation to variations of strength and weakness of organs and their functional capacity, *272* (2); in sedimentation of urine, **663**; one of the three essentials in causing disease, **233**; in exercises, **744**; in regard to birth and "ether," *108*; in regard to venesection, **1020**

Time of year the guide to choosing evacuants, **934** (7)

Timidity, basis of, **1116**

Tissue inter-actions, take time, *32* (*d*)

Toil, effect of, on body, **334**

Tongue, colour of, significance of, **479**

Tooth abscesses, **431**

Tossing about in bed, **455**

Touch, sense of, **175**; what information it gives regarding the patient, **465**

Toxic actions: types of, *194*

Trance, after vomiting, **1012**

Transcendence of organs beyond anatomical boundaries, *123*

Tranquillity, cause of, *139*

Transformation of air into fire, **237**; of matter, **348**

Transformative: faculty, **149**; acting on food, **347** (*c*); needs heat, **158**; power is threefold, **144**

Translucence of urine, versus texture, **606**, **607**

Transmission of disease, **229**

Transparent urine, **628-630**

Travellers, regimen for, **879-885-904**; rules *re* water-supply, **898-902**; preservation of complexion, **897**

Travelling: by sea, rules regarding, **903**, **904**; usually by night, in the East, **882**

Treatment: adjustment according to (*a*) the constitution, *291*, **911**; (*b*) severity of illness, **916**; (*c*) stage of disease, **917**; (*d*) strength of a given organ, **914**; (*e*) temperament, **911**; — contributory factors, **922**; dietetic treatment, *295*, and see Regimen; general discourse upon, **905**; general rules for, **905**; methods of treatment, *289*, *sqq.*; — of disorders of temperament, **925-933**; plan of, *286*; "quack," *288*; regiminal, *296*, and see Regimen; restorative, **833**; rule of, to be persevered with, **919**; varied according to season and climate, **922**, *279*

Trees and ground-water, *176*

Tricking the doctor with the urine-specimen, **673**

Trismus in gingivitis, **715**

Tropical heat, exposure to, regimen for, **885**, **887**

True occult phenomena, classification of, *162* (II)

Trunk, veins of, for venesection, **1025**

Truths inadequately expressed by Avicenna, re-stated, *41*

Truth in different garbs, *42*

Truth underlying ancient Chinese occultism, *6*

Truth versus knowledge, *11*

Tubes of body: (the whole body is made of tubes), *123* (*d*), *273*

Tubular members, structure of, *132*

Turbidity, difference from sediment, **608**; of urine, cause of, *ib.*; significance of, **632**, **638**; versus opacity, **632**

Turbid water, rectification, **899**

Type of house, importance of, *191*

Type of pulse in various conditions (modern), *233*.

U

Ugliness is disproportion of build, **496**

Ulcers, bathing for, **1067**; causes of, **430**; conditions which prevent healing, **1066**; healing by cicatrisation, **1063**; by granulation, **1064**; objects in treatment, **1063**

Ulcerose lassitude, **823**; diet of, **842**; treatment, **830**

Umbilical abscess, **729**

Unceasing movement, *83*

Understanding, the, **183**

Undigested food in blood, **778**

Undulatory pulse, cause of, **571**, meaning of, **540**, **561**

Unhealthy: digestive products, **103**; water, rectified with vinegar, **797**

Uniformity of seasons leads to disease, **267**

Unwholesome foods, corrective for, **792**

Urge in the Chinese system of sphygmology, *209*

Urinal, precautions in use of, **603** (7, 8, 9)

Urinalysis, carried out to test liver-function, *32* (*e*); to test kind of humour at fault in lassitude, **844**

Urinary sediments, list of, **658**; in lassitude, **838**

Urine, **603-674**: adulteration of, **603** (12); changes produced in, by food, **603** (3); characters of, guide to time for exercise, *243*; clear, and becoming turbid, **633**; foam, meaning of, **649-651**; good prognostic signs, **634**; in childhood, **694**; in pregnancy, **672**; in puerperium, *ib.*; inspection, **606**; interpretation of findings, *283*; in winter, **293**; layer formation in, meaning of, **643**; normal healthy characters, **669**; object of study, **605**; odour, signs derived from, **645-648**; of cattle and asses, **640**, of animals, **673**; precautions in collecting, **603**; prognostic points, **617**; ditto of transparent urine, **629**; putrid odour, **648**; quantity of, significance of, **665**; signs showing time of undertaking exercises, *243*; tabular summary, *238*; turbidity, meaning of, **632**; variations with age, **670**; with physiological state, **603** (5); with sex, **671**; white, **618**; significance of white, **619**

Urooj-nasool, *88*, *105*, *138* (i), *275*; and death, *111*

V

Vapours rise out of the earth in spring, **257**

Variations of equipoise, eight, **32**; of anatomical structure, causes of, *119*; in action of innate heat, according to its degree, **485**

Vegetables suitable for old persons, **856**

Vegetative: faculty, **117**, **146**; life, in chart, *159* (i); relation to faculties, *142*; principle, action achieved by means of heat, *133*; soul, its operation, *130*

Veins: **116** (7); choice of, for venesection, **1021**; drainage areas, **1022**

Venesection: **1017**; contra-indications, **1019**; frequency of, **1028**; in fevers, **1029**; mishaps during, **1027** (*e*); modern use of, *289*; procedure, **1027**; proper time for **1020**; repeated, **1028**; syncope during, **1027** G

Verdigris-green bile, explanation of, **84**

Vermicular pulse, **541**, **572**

Vibration-rate, and the elements, *77*

Vicious circles, **225**

View that each faculty has its own member, **138**

Views (three) as to nature of human being, *24*

Vinegar helps to get a drug into the tissues, **932**

Violent exercise, effect on pulse, **595**

Viper venom, **354**, **356**, B

Virtues of Nile water, **370**

Viscera express character of vegetative system, *164*, IV
Viscid blood causes irregular pulse, **564**
Viscous foods, value of, **794**
Visible and invisible cycle, *97* ; visible pulse, *223* ; visible breath in some phases, *146*
Vital air is not breath, *136*
Vital breath is a phase, *148*
Vital faculty (al-quwwa al-hayawaniyya) : **161**, *134* ; defined, *129* (3) ; explained, **163**, **164** ; purpose of, and seat of, **140** ; versus natural faculty, **166**
Vitalism is really rationalism, *24*, *28*
Vitality, *134*, *273* ; a guide to evacuation, **934** (2) ; degree of, effect on urine, *238* ; dispersed by putrefactive break-down, **680** ; impression of, given by patient, *281* ; strong or weak, meaning of, *141* ; versus breath, *136*
Vitelline bile, **84** ; effect on urine, *238*
Vitiligo, **221** (2, iii)
Vitreous serous humour, **74**, **80** ; effect on urine, *238*
Vivaciousness, significance of, **492**
Vociferation, **429**, **742**
Vomiting : excessive, treatment of, **1013** ; how to arrest, **1009** ; ill-effects produced by, **1005** ; methods of assisting, **1004** ; severe, in infants, **725**

W

Wakefulness, a sign of dry intemperament, **493**
Waking, effect of, on pulse, **592** ; on body, **338**, **339**
Walls and doors answer the lute (Quotation), *219*
Warm pulse, cause of, **573**
Wasting, relation to food, **358**
Watching Nature, *292*
Water : after meals, **779** ; and earth not literal, *73* ; as beverage, **797** ; bad, signs of, **371** ; waterbaths, points to note, *197* ; definition of and properties, **22** ; does not become tissue-substance, **361** ; — drinking when travelling, precautions, **898** ; effect on pulse, **586** ; from snow and ice, **376** ; function in body, **361**, the handmaid of nutrition, **362** ; has life-giving power, **22** ; how to counteract harmful characters, **900** ; in various particular cases, **899** ; in nature, which is best, **365** ; in southerly countries, **329** ; is formless matter (Augustine) **22** ; of Nile, virtues of, **370** ; of Oxus, **369** ; properties of pellucid, **361** ; purification by boiling or distilling, **368**, **369**, **898** ; purpose of, **22** ; tests of purity, **367** ; varieties : aerated, **391** ; acetous, **387** ; aluminous, **384**, **899** ; ammoniacal, **384** ; aqueduct, **375** ; channel, **383** ; cold, **389** ; containing metals, **384** ; commendable, **372** ; hot, **390** ; ice, **376** ; marshy, **377** ; milky, **388** ; non-commendable, **377** ; river, **376** ; salt, **386**, **899** ; snow, **376** ; spring, **376** ; stagnant, **378** ; tepid, **390** ; well, **375**
Water-supply of houses, **332**
Watery swellings, **218**
Wave-motions, superimposed, a picture of changes in elements, *88*
Waxing and waning of breath, *138*, i
Ways of evacuating morbid material, **936**
Weak pulse, **523**
Weakness, due to diarrhœa, **445**, opening abscess, *ib* ; severe pain, **446** ; fevers, **447** ; many illnesses, **450** ; of body and breath, causes of, **443** ; of one member a danger, **451**
Weaning, **710** ; quotation from Nights, **710**
Weather, effect on animals, **313** ; stormy, serous humour swellings arise during, **215**
Weight, carried in instalments, an analogy, **555** ; of water, **367**
Well-water, **375**
West wind, effect on body, **371**
Westerly : countries, effect of, **331** ; winds, effect of, **307** (*e*)
Wet Cupping, **1034** ; and dry, *260*
Wet-nurse, characters of good, **700**
Wheat chewing for acne, **99**
White : broth, **812**, **851** ; fæces, **675** (3) ; lead, why poisonous internally but not externally, **399** ; meaning of, **618** ; urine, **618**
Why light rejoices the mind, **1092**
Will, diseases of, *165*, III ; interactions, *ib.*
Will-power and breath, *140*
Wind, constant exposure to, effect on skin, **221**, **2**, ii

Winds: effect on body, **314-317**; prevailing, effect on climate, **307** (*e*); prevailing in the season, and health, **296-301**
Windscreens and climate, **307**, ii
Wine: action on breath, **1105**; on emotions, **1105**; beneficial in bilious temperament, **802**; best only after digestion is complete, **801**; contra-indications *re* age, **810**; cooling effect, **584**; correctives for, **805**; definition, note preceding **800**; effect on humours, **802**; for children, **735**; for elderly persons, **860**; for lassitude, **838**; good action of, **800**; heating effect, **584**; intoxicating effect explained, **807, 809**; ill-effects, **808**; new, action on liver, **806**; not after meals, **782**; not before thirteen years old, **735**; not when fasting, **808**; old, **806**; on pulse, **584**; properties of, in body, **802**; relieves headache, **800**; remedies against, **805**; rules concerning, **800**, *sqq.*; white versus red, **800**
Winter: and pulse, **581**; effect on atmosphere, **246**; changes produced in body by it, **292-295**; diseases of, **294**; obstructions are common in, **420**; regimen for, **876**
Wisdom, *159*; greater than science, *22*; *Appendix 2*
Wolfish disposition in inhabitants of the north, **328**
Woman: as a whole is a matrix (Paracelsus), **125**; effect of northern climate on, **328**
Wonderful every-day facts not understood, **1130**; mistakes made, **433**
Wonders of Nature, *Appendix 2*
Words and their exact equivalents, *37*, *Appendix 1*
World-conception, modern versus ancient, *55*; see Cosmology
World of space and time a fringe, *55*
Worlds, position of, scheme of, *54*
Worms, **730**; in autumn, **289** (iii)
Wounds, **429**; principles of treatment, **1062**
Wrestling, **739** (ii)
Wryneck, treatment, **922**

Y

Yakhmi, stew, *251*
Yang and Yin, *103*, *104*
Yawning, **427, 455, 829**; and stretching, **427**; explanation of, **829**
Yellow, shades of, **609**
Yellowing of skin from exposure to hot atmosphere, explanation, **278, 313**
Yi King, *83*, etc.
Youth, definition of term, **52**

Z

Zardah, a rice-dish, *251*

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